ENGINEERING AND MINING JOURNAL

DECEMBER, 1942

COPPER JOINS THE ARMED FORCES. Casting copper anode plates 99.35 percent pure—the last process preparatory to refining at Anaconda's electrolytic plant in Montana

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In this issue

MacIntyre Development—New Source of Titanium
Coronet Phosphate's Conveyor Belt Flotation
Itabira Iron Ores of Brazil
New Surface Plant at Mather Mine
A Feldspar Grinding Plant in Tennessee
An Arkansas Travelogue
Complete Contents on page 39

LIKE FALLING INTO A SEWER AND COMING UP STUDDED WITH DIAMONDS

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The fallacy of "distant pastures look greener" and the moral of the book "Acres of Diamonds" has again been proven, almost in the backyard of New York mining men. A certain property was worked for pigment ores many years ago, but with mediocre success. The present owners realized that the tailings from the plant contained a considerable amount of other ores. At the outbreak of the war in Europe, the management realized that recoverable metals from these other ores probably would become critical. By the construction of extensive new railroad facilities, by the installation of efficient mining and milling equipment, including Hydroseal Pumps (for handling large tonnages and for the recovery of the strategic metals from the other ores, as well as the pigment), this property is not only profitably operated but has now become an essential factor in our war effort. . . . From the start, Hydroseal Pumps have been on the job, three slurry pumps in each of four sections of the mill, and are helping in no small way the overall war effort, quietly and efficiently. Two of the installations are shown above. . . . Perhaps Hydroseal Pumps can help in an equally important way in your plant. Our Catalog No. 140 will give you details.

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Brazil's iron ores will be discussed from the standpoint of mining methods and costs in the second installment of Mr. Malozemoff's article. The Arkansas Travelogue will also be continued next month.

▼

Venezuelan gold lodes of importance will be described by Paul A. Bundy in our next issue. Mr. Bundy's work as mining engineer and geologist for New Goldfields of Venezuela, Ltd., has provided a fine background for his thorough analysis of the geology of a region of great possibilities.

▼

Phosphate débris, a tailing product of washing operations in the Florida pebble field, is mined hydraulically and pumped to modern recovery plants for re-treatment. (*E.&M.J.*, Sept., 1942.) Data on one such pumping operation, obtained by engineers of International Minerals & Chemical Corp., will be presented next month.

▼

Selecting employees who will serve the best interests of a company and who will also want to continue to serve them is a problem of major interest to both employer and employee. In March, *E.&M.J.* will present The Dorr Company's attitude on and experience in choosing and training young engineers for laboratory, shop, and sales staffs, as outlined by G. M. Darby, manager of the Westport, Conn., mill of The Dorr Company.

▼

Flotation cells constructed before now for test work in the laboratory have featured small size and transparent construction to facilitate their use. J. Bruce Clemmer and B. H. Clemmons, both of the Bureau of Mines Experiment Station at Tuscaloosa, have designed and built a new cell of this class, incidentally made of the plastic lucite. Of special interest is the inclusion of a device for filtering the froth and returning the filtrate to the cell during the run. The description will be printed soon.

H. W. CLARKE
Publisher

ENGINEERING AND MINING JOURNAL

R. M. WARD
Manager

Published by McGraw-Hill Publishing Co., Inc.

H. C. PARMELEE
Editor

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Publication Office: 99-129 N. Broadway, Albany, N. Y.
Editorial and Executive Offices: 330 W. 42d Street, New York, N. Y.
Cable Address: McGraw-Hill, New York

Branch Offices: San Francisco, 68 Post St.; Chicago, 520 N. Michigan Ave.; Los Angeles, Calif., 601 Fifth St.; Washington, D. C., National Press Building

District Managers: New York, T. E. Alcorn, F. W. Roets; Philadelphia, J. F. Cleary, W. A. Potter; Cleveland, W. M. Spears; Detroit, W. S. Drake; Chicago, S. J. Alling; St. Louis, R. Y. Fuller; San Francisco, J. W. Otterson

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Aldwych House, Aldwych, London, W. C. 2, England
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DECEMBER, 1942

Volume 143 Number 12

Jobs on the Potomac

EMPLOYMENT CONDITIONS in Washington remind one of the cynical remark of an industrialist to a visitor who was greatly impressed with his host's large organization. "How many people work here?" asked the visitor. "Oh, about half of them, I think," replied the industrialist. And so it is with the war bureaucracy in Washington. The working half works hard; those of the other half get in each other's way trying hopefully to find something to do.

One aspect of the subject is revealed in the report of a subcommittee of the Senate Committee on Appropriations on "Transfer of employees, conserving office space, relief in housing conditions, and promotion of economy and efficiency." In this report the term "parasitic" is used to describe publicity and public relations writers that fill the mail with tons of useless departmental propaganda. The inquiry disclosed the existence of 1,026 persons in publicity jobs at a total annual salary of $2,596,327. On the federal payroll as a whole are more than two and one-half million persons, thousands of whom might better be in the armed forces or in industry.

Financial wonder workers also were uncovered. The philosophy of deficit financing was found strongly entrenched, particularly in the Bureau of the Budget, where fiscal policies are controlled. There and in the National Resources Planning Board theoretical economists advocate deficit spending as a national policy. By virtue of his position as principal fiscal analyst for the Bureau of the Budget, Dr. Gerhard K. Colm is in an enviable position to practice what he teaches. Earlier in his career Dr. Colm was lecturer, professor, or research expert for the Berlin School of Business, Kiel University, Statistische Reichsamt, the Enquete Ausschus, and the German delegation on reparation payments. One wonders how this loyal patriot filtered into so important a job in the United States. Surely not in daylight.

So, whether in large numbers or small, high places or low, bureaucratic Washington is cluttered up with people who ought to be doing useful work in industry or fighting in the armed forces. More power to Senate leaders who are trying to clean up an intolerable condition that would not for a moment be allowed to prevail in private business.

Deferments Not Permanent

DESPITE THE CIRCUMSTANCE that the armed forces now fully recognize and acknowledge the vital part that most mines play in the war effort, we feel in duty bound to pass on to the industry the admonition of General McSherry that "there is no such thing as permanent deferment."

This means that operators must regard the men who have been returned to the mines from the army, or who have been deferred because of occupation, as only temporarily lent until substitutes can be trained. It is still necessary to plan that every able-bodied man, regardless of dependency, between the ages of 18 and 38 will be in uniform by the middle of 1943. Unless the war outlook changes so favorably that a full-strength army will not be required, the employer who is lackadaisical about finding substitutes because his output is essential is due for an unpleasant surprise.

McNutt strongly advises employers to prepare "manning tables" and submit them to draft boards. A manning table is simply a schedule of employees showing which can be spared now, which can be replaced three months, six months, nine months hence, and which cannot be replaced at all. He points out that possession of a manning table will enable a draft board to perform its job with minimum dislocation to an industrial unit.

Conservation of Engineers

IT WAS INEVITABLE that formal education in the United States should be badly disrupted by the war. Colleges and universities, particularly small liberal arts institutions, were foredoomed to decimation of students and faculties, even to the point of closing their doors or merging their weakened resources.

But the impact of the draft on student bodies did not stop with liberal arts schools. Technical manpower also was affected. And now that the draft is dipping down into the "teen-age" group of students, it will still further disturb the supply of engineers and technical men so badly needed by both the armed forces and industry.

On sheer logic, Selective Service should and does make an effort to conserve technical manpower for the war industries; but unless modified, the new draft law will stop the training of engineers, not only to the detriment of the war industries and the armed forces but also to the disadvantage of civilian industries after the war is over.

It is to this situation that the American Institute of Chemical Engineers recently directed the attention of the President and the War Manpower Commission. The Institute urged that the plan of occupational deferment announced last June be reaffirmed for the deferment of men in engineering training, at least until the end of the term in which they reach the age of 18, and thereafter term by term as long as their academic records are satisfactory. The Institute shows by arithmetical computation that adoption of this policy would deprive the armed forces of only three days' supply of students reaching age 18 each year. This relatively insignificant quantity, but highly valuable quality, of technical manpower is probably the minimum that will be required for the war effort. Of equal importance is the fact that it will provide engineering competence in the post-war period. The proposal merits the consideration of the Selective Service System and the War Manpower Commission.

Patents and Progress

IN VIEW OF THE ATTACKS that have recently been made on the United States "patent monopoly" by Thurman Arnold and other radical proponents of reform, it is refreshing to see eminent and able engineers and lawyers coming to the support of our patent system. Admitting the existence of abuses, and offering to cooperate in their correction, these advocates of the "patent monopoly" rightly urge that its advantages are paramount and have been a weighty force in developing the industrial might of the nation.

A. A. Potter, dean of engineering at Purdue, is among the latest to defend publicly the essential features of our patent system. He regards our great inventors as "the Pride of America," and points out that Americans more than any other people have been responsible for the epoch-making inventions of the past century. Foremost in developing transportation, communications, and industrial processes, American inventors have contributed most to high standards of living. Their resourcefulness, initiative and creative talent must be encouraged by a patent system that will offer incentive to them and benefit to the public. Inventive genius has proved to be one of our greatest assets in the war, just as it will give great impetus to progress in a world at peace. Let the patent system be improved as time reveals its defects, but let no tinkering social reformer alter its basic structure. It has been instrumental in spotlighting "the Pride of America."

Not Smart Enough

FROM TIME TO TIME we have felt that the system of private enterprise is dangerously "on the spot." But as the war has progressed and industrial production has come progressively under the heavy hand of government, our fears for the future of the system have been partly allayed. The stumbling inefficiency and ponderous ineptitude of the vast bureaucracy that has been built up in Washington convinces us that in peacetime the people will not tolerate it when they realize its cost. Some of our best brains are having difficulty in making it work, even with the benefit of wartime necessity, and we doubt that the bright boys of the New Deal are smart enough to convert their dreams into stable organizations. The whole spectacle is reassuring evidence of the futility of trying to regiment the complex economy of the United States. Free interplay of private forces, reasonably supervised, still offers the best solution for a prosperous and an efficient industrial economy.

ANNUAL INDEX

THE ANNUAL INDEX to the current volume of *Engineering and Mining Journal* is bound in this issue immediately following page 130.

Reflections from Washington

Washington News Bureau

MINE AND SMELTER operators and their suppliers who have been beset trying vainly to keep up with the dizzy whirl of orders, amendments, and regulations governing the priorities system, will regard their past difficulties as trifling after they have gone through the next six months. One reason why past systems have been impossible to live within is that they have been too complicated and too frequently altered to be quickly adapted to the minds and habits of industry, particularly of small operators who do not have the benefit of special counsel. Now industry is faced with a new device, the Controlled Materials Plan, which far outstrips all predecessors in complexity, but does away with none, as it only supersedes them with respect to the "controlled materials," copper, steel, and aluminum. This new procedure, by which allocations will be made by a supreme "requirements committee" through seven "claimant agencies" to "prime contractors" and through them to their suppliers, will function strictly in accordance with previously planned production schedules. CMP goes into effect in the second quarter of 1943, during which efforts will be made to nurse along industries which find difficulty in complying. After July 1, it will be necessary to "root, hog, or die," as no consideration will be given to those who cannot conform. However, even though the plan is not effective until the second quarter, it is necessary for industry to submit its needs to prime contractors or claimant agencies at once, as claimant agencies are expected to submit their requests to the requirements committee by Jan. 1.

Vertical Allotments

CMP is characterized as a vertical allocation plan instead of a horizontal one (PRP). Materials requirements, as bills of materials, will flow upwards to Washington through regular industrial supply channels. Allotments of material supplies will reverse the trip back through the supply line, also through industry.

At the top the seven claimant agencies for the total supply of the controlled materials are: Army, Navy, Maritime Commission, Board of Economic Warfare, Lend-Lease, Aircraft Scheduling Unit, and the Office of Civilian Supply. Prime contractors in each of these fields will submit their bills of material to their claimant agency; subcontractors and their suppliers will submit their requirements to their prime contractors.

Civilian Supply is the claimant agency for all non-direct military requirements, including mining machinery and mine maintenance and operating supplies. WPB's mining division, under Arthur S. Knoizen, will be the "prime contractor" for this field, and the mines, smelters, and manufacturers will provide the mining division with their requirements, so that a total bid for allotment can be passed up to Civilian Supply, there fitted in with other needs, and presented to the requirements committee as part of a single request.

Presumably CMP will gradually be made to embrace more and more kinds of material. For the present, however, it applies only to copper, steel, and aluminum. Other materials must be obtained by procedures now in vogue, such as P-56, P-58, P-73, and PRP.

Simply because CMP is complicated may not mean that it cannot be made to work, if WPB learns how to become "hard boiled." Previous plans have fallen short partly because WPB was never able to discipline its own personnel to hold commitments within estimated needs. There are signs that the new boss of materials, Ferdinand Eberstadt, will have some scalps at his belt before he lets CMP fail through lack of internal discipline.

WPB Organizational Changes

THE materials distribution and operations side of WPB—as distinct from its policy and production offices—were merged and reshuffled in November as a preliminary to getting started with CMP. In the new set-up virtually all authority flows directly to Ferdinand Eberstadt—the former office of Director General for Operations held by Ernest Kanzler, with the same title and functions, is now the administrative side of Eberstadt's Office of Program Determination.

The reorganization grouped WPB's three-dozen-plus industry and commodity branches, which are renamed divisions, into five newly established bureaus, each reporting directly to Kanzler and Eberstadt. Chief in importance to the mining industry is the minerals bureau, headed by Joseph M. Scribner, of the Pittsburgh firm of Singer, Deane & Scribner, drafted for the job from his post as assistant to Kanzler. To this bureau report the mining, lead-tin, zinc, mica-graphite, and miscellaneous minerals divisions (originally branches). All of the divisions retain their former chiefs and staffs, except for Wilbur Nelson, who takes an advisory position.

The steel, copper, and aluminum-magnesium divisions keep their independent status and become key agencies in the allocation of the three metals under CMP.

Between the commodity divisions and the top office, Eberstadt inserted a layer of policy agencies—a program bureau, facilities bureau, distribution bureau, and resources agencies bureau to work with the divisions in putting policy determinations into operation.

End-Use Symbols Out

FEW tears were shed over the demise of the allocation classification system which was killed off in one short sentence issued by WPB in November, which read, "Priorities Regulation No. 10, establishing the allocation classification system, is hereby revoked." With the new controlled materials plan in the offing, the cumbersome system of end-use symbols was considered no longer useful.

The copper division, however, continues the requirement of end-use information from brass mills, copper wire mills, and copper foundries before making allocations. Customers of mills and foundries must supply as much end-use information as possible to enable their suppliers to get authority from WPB to fill the orders. Orders M-17 and orders in the M-21 series which require certain end-use information for the iron and steel division are not affected by revocation of regulation No. 10.

Ratings Stepped Up

INFLATION of priority ratings goes on unabated. Order P-56 was amended in November to provide an AA-2X for maintenance and repair needs for mines. (p. 66.) Also, the top priority rating of AA-1 may now be applied, with special permission from the mining division, when needed for essential maintenance and repair. This was done to "make it

possible for vital plants and factories, mines and refineries and other industrial facilities to continue effective production of both munitions of war and essential civilian goods."

Since the mining machinery manufacturers' Order P-56-a is operating only informally, the immediate extension of these high ratings will be of considerable importance to the equipment manufacturers. It may mean the difference between a normal supply of repair parts and a very short supply in the near future.

Change in Over-Quota Premium Settlements

EFFECTIVE DEC. 1, a new basis of premium settlements was instituted by Metals Reserve. The basic rates of premium are unchanged—although the statement by Leon Henderson quoted in last month's *Reflections* indicated that changes are in the offing—but the new basis presumes a standard recovery percentage for all shippers, whereas settlements made heretofore have been based on actual recoveries according to smelter or custom mill settlements. The new system presumes that when ore is shipped to a custom mill or Waelz plant, the metal recovery will be 87 percent of the total copper content, 86 percent of the lead, and 77 percent of the zinc; settlements are made immediately on that basis as soon as assays are available, without waiting for the mill returns. In the case of concentrates shipped to smelters, recoveries are assumed to be 97 percent of the total copper content, 70 percent of the lead, and none of the zinc, if shipped to a copper smelter; 85 percent of the copper, 95 percent of the lead, and none of the zinc, if shipped to a lead smelter; and 70 percent of the copper, 60 percent of the lead, and 90 percent of the zinc, if shipped to a zinc smelter. This will also permit immediate settlement as soon as assays are reconciled, without waiting for the smelter returns. To put the Tri-State district in balance, the zinc concentrate premium was raised from $28.05 to $29.70 per ton, and the lead concentrate premium from $39.60 to $41.80 per ton, presuming a recovery increase to 90 and 95 percent, respectively.

Gold-Mine Orders

THE ORDER closing gold mines producing more than 1,200 tons per year was apparently nailed down when the machinery of the affected operations was frozen in the hands of its owners by an amendment to Order L-208. Equipment of the types listed on Schedule A of Order P-56 may no longer be sold without WPB permission; it must be inventoried and reported to WPB by mid-January, or within 60 days after revocation of a P-56 serial number.

The lists sent to WPB must indicate the pieces of machinery the owner is willing to sell or rent, so that WPB can distribute the available units to other mines where production of critical metals can be bolstered most.

Another provision of the amendment granted permission to do the minimum assessment work required by law.

The contention of the gold-mine operators, that so few men have been made available for other work by the closing order that the cost far outweighs the gain, is true. However, the order probably will not be countermanded, despite the fact that no parallel steps have been taken to close down other industries regarded as non-essential. Thus, Washington is in the inconsistent position of continuing to supply gold mines in other countries and to purchase their output, while having selected the gold mines of this country, out of a host of industries regarded as non-essential, as the exclusive victims of direct action.

Although there is no sign that the closing order will be rescinded en toto, it is likely that some back-door relief will be afforded. In late November announcement was made that Homestake would be given a six-month extension of time for the mining and milling of ore already broken (p. 82).

Truck Regulations

OFF-THE-HIGHWAY automotive equipment used within the mine area does not have to have a certificate of war necessity. An exception to that effect has been made to ODT Order 21. The exemption includes not only heavy trucks hauling between shovels and hopper in open-pit operations, but also other rubber-tired units such as fresnos, motor graders, and other pieces of equipment commonly used in and around mines for construction and maintenance work as well as in some of the normal production operations.

Trucks used on the highway are not covered by the exemption. These units are classed as commercial vehicles and require a certificate of war necessity.

The time limit for manufacture of off-the-highway trucks was extended for a period of three months in mid-November, but no change was made in the program for 500 trucks.

Condition of roads and trucks that mines in remote locations must use to transport supplies to and from the properties is the subject of concern in Washington as well as in the field. The non-metallic minerals transportation advisory committee considered some of the problems of access road maintenance at the committee's first meeting, in November.

Specifications for the loading of freight cars contained in ODT Order 18, revised, went into effect Nov. 1. Carriers are prohibited from accepting cars that are not loaded to capacity. This provision will seriously affect that part of the mining industry that is in the habit of selling less than a full car of material shipped in bulk. This subject also was discussed by the committee.

Manning Tables

MINE OPERATORS and mine equipment manufacturers, along with all other segments of American industry essential to the war program, were offered in November a plan designed to permit an orderly withdrawal of draft-eligible men from their jobs. This is the manning table plan—so labelled, not after a man's name but as descriptive of its scope.

A manning table is a listing of different skills in a mine or factory and of the number or workers required in each skill to maintain production schedules. It also involves determination of the time required to train replacements for each skill. Superimposed upon this table is another showing the employees, by skills, who are subject to military call. The final step is a working out of an orderly schedule for withdrawal of the draft eligibles as replacements can be prepared for their places.

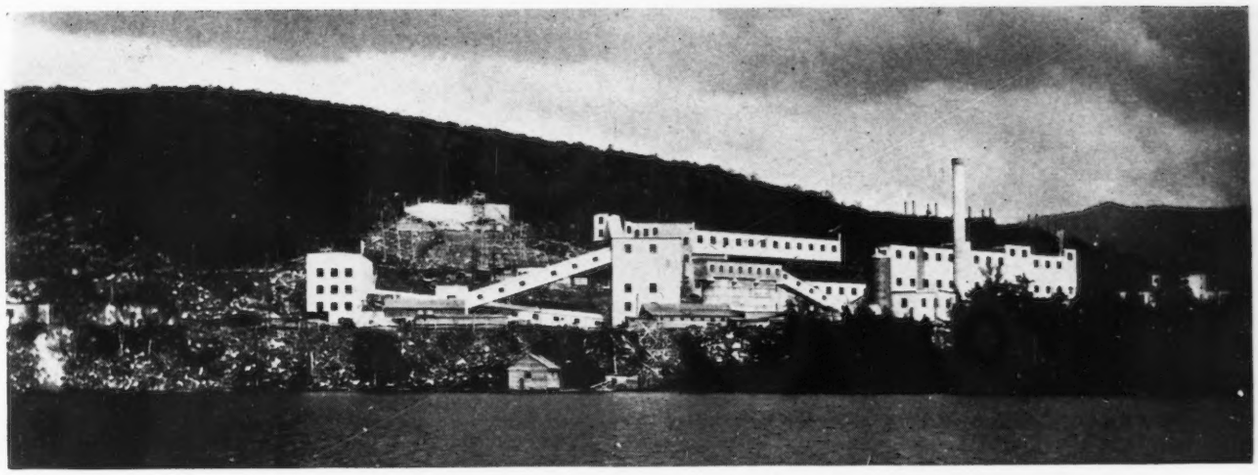
Only those activities essential to the war effort will be permitted to have recognized manning tables. Voluntary at this stage, the plan is put in motion for a given firm by application to the War Manpower Commission for the standard forms and the assistance of government specialists in drawing up the tables. Once okayed by WMC, individual manning tables go to State Selective Service directors for certification numbers and these may then be attached to all Form 42A employer occupational deferment requests to local boards.

It is the intention of Washington that local boards will grant deferments specifically set up in manning tables and that such action will become almost automatic. However, it is not yet planned that 42A's without support of manning tables will be disregarded.

Ore and Metal Price Changes

THE AUTHORITIES mean to get greater domestic production of alloying metals. Recent changes in the price structures have been made with this end in view. The Metals Reserve Co. has been given greater latitude in its operations and domestic consumers have been given stable prices on which to plan their future operations.

(*Continued on p.* 118)



MacIntyre mill of National Lead Co. on the shore of Lake Sanford in the Adirondack mountains of New York

The MacIntyre Development—New Source of Titanium

I. D. Hagar
General manager,
MacIntyre Development
Titanium Division
National Lead Co., New York, N. Y.

National Lead Co. reopens century-old Adirondack mining district to replace lost foreign supplies

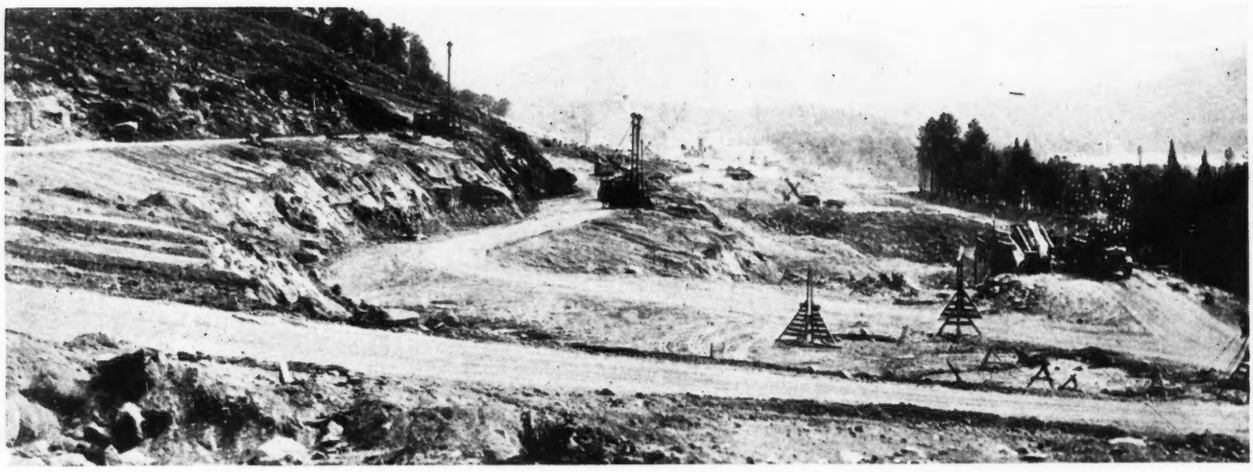
FEW of the world's mining communities are in regions so attractive that living in them can be called pleasant, or, in some localities, even comfortable. This statement will be indignantly denied by any number of miners who, for one reason or other, cherish a fondness for some particular section of barren mountainside, desert, or swamp in which they have lived and worked; but the fact is that few mineral deposits have been kind enough to locate themselves in spots which one might pick for a vacation. That is why those men now engaged in developing the MacIntyre titanium property, near Newcomb, N. Y., for the National Lead Co., might be considered fortunate. This mine is in the center of one of the finest fishing, hunting, and general vacation countries in the eastern United States. In fact, a good part of the mine property was purchased from a fish and game club, and the mill, which will produce ilmenite concentrate for the paint industry, is built on the shore of one of the most beautiful lakes of the Adirondack region. The manner in which this came about makes an interesting story, tied up as it is with both the early history of New York and the demands of the present World War.

Titanium dioxide, used as a white pigment, gives to paints an excellent opacity, whiteness, and brightness, and, in addition, maintains stability because of its non-reactive character. Use of titanium pigment has steadily grown in recent years until the dollar value expended on it now exceeds that of white lead, zinc oxide, and lithopone combined. The chief source of titanium dioxide is the mineral, ilmenite ($FeTiO_3$), which is found associated with iron ores in large deposits in Norway, Madagascar, Canada, and the United States. Before National Lead began development of the MacIntyre deposit, however, most of the ilmenite used for pigment in the United States came from placer-sand concentrations of the mineral together with monazite, zircon, and rutile. Florida deposits of ilmenite were used for a time, but for the past several years India, Africa, and Brazil have furnished as much as 250,000 tons annually of ilmenite concentrates for the titanium pigment industry.

When war demands began to make themselves felt on shipping schedules, the Titanium Division of National Lead Co. found it increasingly difficult to arrange for transportation of its concentrates to the United States. Available ships were fewer and many of those still running were required to carry cargoes of manganese, tin, and rubber, more urgently needed than titanium. Gradually it became apparent that the war would effectively prevent shipment of adequate cargoes of titanium, and a domestic source of ilmenite was therefore sought, for, although manganese and rubber took priority on cargo space, titanium pigments also play a large part in wartime construction, the protection of fighting equipment, and in camouflage work.

In seeking a new source of titanium, the engineers of National Lead had not far to look, for the discovery of the possibilities of titanium oxide as a pigment came as a result of tests made on ore brought down from the MacIntyre deposit in Essex County, New York. Reexamination of this deposit proved the existence of sufficient ilmenite to insure an abundant supply, and test work demonstrated that it could be concentrated to a usable grade. Construction of a mill and development of the mine began in 1941 and full production is now under way, 116 years after the discovery of iron ore deposits in this area and the first attempts to smelt the ores.

Essex County, in northeastern New



Cutting out the first benches on the MacIntyre orebody. Bucyrus-Erie churn drills and shovels are used

York, is the second largest county in the State and most of it lies within the boundaries of the State-owned Adirondack Park, set aside in 1912 as a playground for sportsmen and vacationists. The MacIntyre ore deposit lies in the southwest corner of Essex County about 20 miles south of Lake Placid and is therefore in the heart of this vacation land. A more pleasant setting for a mining community would be hard to imagine.

Sanford Lake, on whose shore the new mill has been constructed, is a part of the system feeding the Hudson River, and the only connection with the mine at present is by rail to North Creek, on the upper Hudson River, and thence by road about 32 miles to the mine.

Relatively isolated though it is, the MacIntyre orebody has a long history of attempts at exploitation by men whose courage and industry deserved a better reward. In 1826 Archibald MacIntyre and Duncan MacMartin were working a small iron furnace at North Elba on the headwaters of the Ausable River. The quality of the ore, brought from Clinton County, was poor, and they were therefore on the watch for something better. While on a prospecting trip to investigate rumors of a silver mine near by, MacMartin, MacIntyre's son John, and a friend, David Henderson, fell in with a St. Francis Indian who knew of no silver in the region but who spoke glowingly of a rich vein of iron ore not far away. His price for showing them the vein came to 50c. from each of the party and a plug of tobacco; on the payment of which he led them across the mountains to the head of Lake Sanford and an obviously rich ledge of solid iron ore. The party immediately put the Indian under guard as a protective measure and set out post haste for Albany in great anxiety to file a claim on their discovery. That winter they were successful in purchasing from the State of New York, at 10c. an acre, a tract of 105,000 acres completely covering any possible extension of their find. What became of the Indian is not recorded.

Following some years of development and organization, a road was finally pushed through from Lake Champlain and in 1830 the first ore was finally brought out, tested in a primitive charcoal smelting furnace, and pronounced good. Archibald MacIntyre thereupon became head of a new company, incorporated in 1839 as the Adirondac Iron & Steel Co., and development proceeded, albeit under tremendous difficulties of transportation and supply. By 1838, David Henderson, now manager of the firm, had built a small blast furnace near the mine and was operating it with such success that a small community, known as Adirondac, had grown up around the site. Henderson pushed his company's affairs so actively that before long they were able to build a $100,000 plant in Jersey City to use the Adirondac iron in producing what they thought of as "cast steel." Steel from this plant was awarded a gold medal at the World's Fair in London in 1851, a mark of extremely high favor in those days.

A most unfortunate hunting accident removed Mr. Henderson from the scene, however, in 1845, and without his energy and ambition, the enterprise did not prosper, although new furnaces were built and new settlements sprang up, among them the village of Tahawus. A series of misfortunes, culminating in the financial panic of 1857, so discouraged the owners that operation halted completely in 1858. Only a few remnants of the old blast furnace remain to mark the location of the town of Adirondac.

Following the failure of the Adirondac Iron & Steel Co., the property passed though a number of hands, but under James MacNaughton, grandson of Archibald MacIntyre, it became the property of the MacIntyre Iron Co., and, because of lack of interest in its possibilities as a mine, was leased to a succession of fish and game clubs, the latest of which, the Tahawus Club now reorganized as the Upper Works Club, was formed in 1897.

The MacIntyre Iron Co., however, continued sporadic attempts to develop interest in its iron ores, but found difficulty in meeting newer specifications for steel. The trouble it was found was caused by the presence of titanium, so in 1890, MacNaughton engaged Dr. A. J. Rossi, a young French chemist, to help them with the MacIntyre ores. Because of Rossi's experience in smelting titaniferous iron ore and his interest in titanium generally, he was able to operate a small blast furnace in Buffalo using MacIntyre ore. He also produced titanium alloys of various kinds, and eventually hit upon the use of titanium dioxide as a pigment. Two companies grew out of his investigation; one, the Titanium Alloy Manufacturing Co., incorporated in 1806, and devoted to producing ferrocarbon titanium used for purifying steel; and the other, the Titanium Pigment Co., which is the parent company of the present Titanium Division of National Lead. In working out his method for producing TiO_2 from ilmenite, Rossi's raw material was the MacIntyre ore, and it seems quite fitting that the company he helped to found should at last make use of the ore which stimulated his original discovery.

When the suitability of titanium dioxide as a pigment became more widely recognized, several plant expansions were required, until today about 1,600 men are occupied in manufacturing National Lead's "Titanox" pigments. Raw material for this industry came largely from India, but when the war interfered with ocean transportation, a new source had to be found. In 1941 negotiations with the MacIntyre Iron Co. were finally completed, and National Lead Co. began work on deposits near Sanford Lake.

The Sanford orebody consists of irregular fine-grained masses of mixed ilmenite and magnetite distributed in an anorthosite country rock. Apparently the deposit was formed by segregation within the original magma, but a fortunate circumstance is that the mixture of ilmenite and magnetite is mechanical, and grinding to minus 20 mesh suffices to liberate the two minerals both from each other and from the included gangue. The extent of the orebody has been estimated by core-drilling to include in the Sanford Hill deposit approximately 15,000,000 tons of ore containing 16 percent TiO_2. This will supply the titanium pigment industry at present rates for about ten years.

Ordinary open-pit methods of mining are being used in exploiting the deposit. Ore is drilled and blasted in benches, Bucyrus-Erie, 29-T churn drills being used to drive the blast holes. Broken ore is loaded by 2½-yd. Bucyrus-Erie electric shovels into trucks for haulage to the mill. At present six trucks are being used for this service, four Euclid 15-ton trucks and two 28-ton Macks.

At the concentrator, mine ore is further broken in a Birdsboro-Buchanan jaw crusher, 48x60 in. Secondary crushing is accomplished by two cone crushers: the first, a 5½-ft. Symons standard cone crusher; and the second, a 5½-ft. Symons short-head cone. Screens and conveyors are arranged in closed circuit with these crushers to provide a crushing plant output of minus ½-in. ore.

Fine ore is ground in four rod mills operating in closed circuit with screens to minus 20 mesh. The ground product is then passed through a battery of 12 Crockett wet-belt magnetic separators, which are adjusted to remove the magnetite from the ilmenite, which is only slightly magnetic. The magnetite concentrate is dewatered, transported by truck to the rail head at North Creek, and shipped from there for use in the steel industry.

Tailings of the Crockett separators are sized in Fahrenwald classifiers into three products—roughly, coarse sands, fine sands, and slimes. The two sand products are then passed over Deister Plat-O tables. Ninety-six of them are in use at present, and rough ilmenite concentrates are produced. Slimes from the Fahrenwald sizers are sent to hydroseparators, the underflow of which is tabled and the overflow is sent to waste. Allen cones and Dorreo filters are used to dewater the ilmenite table concentrates.

The filtered concentrates are then thoroughly dried in six steam-coil dryers heated by two coal-fired boilers, each one of 500-hp. capacity. Passing from the dryers, the concentrates are treated in 21 Wetherill dry magnetic separators which make a final concentration of the ilmenite. The result is a product which contains about 48 percent TiO_2. Stored in the shipping bins at the mill, this concentrate is finally trucked to the Delaware & Hudson at North Creek, 32 miles away, for shipment to the processing plants of the Titanium Division of National Lead.

Dr. Rossi's original work, of course, demonstrated the suitability of MacIntyre ore for pigment production; but, as mentioned before, the magnetite also plays a large part in our war economy. The magnetic concentrate of the Crockett separators contains nearly 60 percent iron and is extremely low in phosphorus. It does, however, contain about 9 percent TiO_2, which presents something of a problem in the use of this ore in blast furnaces. Titanium in blast furnace charges appears to stiffen the slag somewhat, but recent tests indicate that ores containing up to 15 percent TiO_2 may be handled without serious difficulty. Out of the 4,000 long tons of ore mined per day, 800 tons of ilmenite concentrate and 1,600 tons of magnetite concentrate will be produced. The addition of 500,000 tons of high-grade iron ore to our war supplies will be extremely welcome, aside from the value of the ilmenite. A further possibility has been found in the discovery that the magnetite also contains 0.35 percent vanadium. Our previously known domestic sources can supply only a part of the greatly increased requirements of vanadium, but the content of the MacIntyre magnetite will go a long way toward making up the deficiency. Research on this problem is now under way.

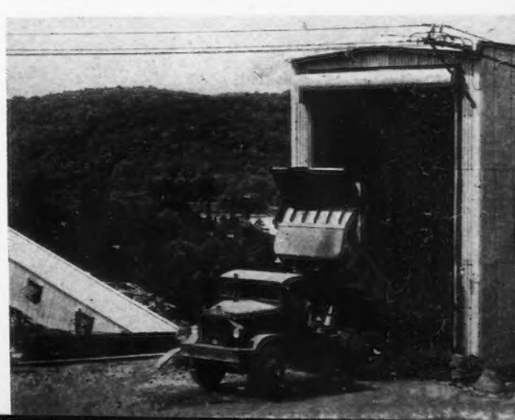
Beginning with nothing but the deeds to a tract of wilderness far removed from the normal sources of supply, National Lead's engineers and workmen have, in a little more than a year, cleared the land, erected the mill described in the foregoing and opened and developed a mine on the Sanford orebody. Naturally this involved much supplementary work. A right-of-way for the power line 42 miles long and 100 ft. wide was cut through the forest from Ticonderoga, and along it were set up 494 towers, each one made of two or three western red cedar poles 45 to 75 ft. long. To carry the 5,000 kw. of power demanded at the mine, 137 miles of seven-strand copper wire was strung on these towers. Reservoirs were built: one, of 750,000-gal. capacity for mill operation, and the other, of 350,000 gal., for community needs. A complete water purification system accompanies the latter. A complete village community, with all facilities for employees and their families, has been built. Garages, fire-fighting equipment, stores, streets, lighting equipment, sewers, machine shops, all the thousand and one things needed in an average community, have been provided. The entire project has been financed out of earnings and surplus of National Lead Co.

That the government recognized the importance of the MacIntyre development is evidenced by the fact that a blanket rating of A-1-c was assigned to the project when the work began. This priority was the first of its kind issued to a commercial enterprise not actually engaged in armament production. Titanium pigments are widely used in connection with war industry building construction, and all possible aid was therefore given National Lead to insure an adequate supply of this material. As ways are found to utilize the magnetite production of the mine, together with its vanadium content, it is believed that the MacIntyre mine will become an even more valuable addition to the war, and to the peacetime, economy of this country.

Bucyrus-Erie 2½-cu.yd. shovel loading a 15-ton Euclid truck on one of the benches

Road from the mine to the mill on the lake shore

One of the six trucks now in service dumping ore at the mill crushing plant



Systematic Methods Improve Scrap Drive

American Metal Co., Ltd., increases yield of salvaged material at Carteret, N. J., smelter by centralizing authority for its disposal

AS PRODUCTION of war industries continues to increase beyond all pre-Pearl Harbor expectation, the salvaging and re-use of all possible scrap material has become of unprecedented importance. Scrap drives, carried on in nearly every community in the country, have focused public attention on this lowly element of our economy, but the sort of material gleaned from such drives cannot be compared in value to the heavier scrap material obtainable from industrial plants, mines, and farms. In addition, industrial scrap will, in general, provide a steadier flow of material than will the intermittent outbursts of enthusiasm resulting in community drives.

As an example of industrial accomplishment in salvage work, James MacNee, Jr., of American Metal Co., Ltd., has furnished the accompanying data showing results of the scrap collection method recently put into effect at the smelter and refinery of United States Metals Refining Co., Carteret, N. J., and at the several mines operated by American Metal Co., Ltd. These data refer only to operations since February, 1942, for prior to that time, scrap collection at the smelter was not a formal part of plant operation and no records were kept. As soon as the urgency of scrap salvage became apparent, however, the smelter management assigned the responsibility for this job to a committee of three, who thereafter arranged for the collection and disposal of all available scrap around the plant. Earl Melick is chairman and is assisted by P. B. Garber and M. W. Merrill. Each of these men is carrying out these duties in addition to his regular work.

Methods of scrap collection are simple. Working in cooperation with heads of the various departments in the smelter and the refinery, the committee of three merely provides men and trucks to collect, sort, and dispose of the scrap as it accumulates. Bins are provided in each department for storage of small items of scrap of various kinds, and each department head instructs and encourages his men to be on the watch for scrap material and to allow nothing to be wasted. In each department as scrap accumulates, the foreman notifies a scrap committee member, who arranges to have it collected and properly disposed of.

An idea of the size of the Carteret plant may be gained from the fact that in 1940 it had a capacity of about 120,000 tons of copper and 30,000 tons of lead per year. The accompanying table shows what this plant managed to accumulate in scrap material in six months from February through July, 1942. Only total figures are available for 1941, but a calculation based on the totals for the six months of 1942 and for all of 1941 shows that iron and steel scrap was collected at a rate of 6,678 lb. per day in 1941 and at a rate of 7,918 lb. per day thus far in 1942—an increase of about 19 percent. This, of course, does not mean that scrap is collected daily to this amount, but it does indicate that increased watchfulness has resulted in the accumulation of more scrap material.

As soon as it became evident that the methods in use were resulting in increased scrap collection, the other branches of American Metal Co. were told about them, and similar measures have been taken at these other plants. Most notably successful in scrap collection have been the copper mine, Minas de Matahambre, at Pinar del Rio, in Cuba, and the Blackwell Zinc Co., at Blackwell, Okla. Scrap from the mine in Cuba must, however, be shipped to the United States at the company's expense, for there is no satisfactory scrap market in Cuba.

Aside from the increased scrap metal collected, considerable benefit has been derived in the present salvage campaign from more careful handling of the burlap bags in which concentrates are received at the smelter. Particular attention has been paid to prevention of damage to these bags in emptying them, with the result that, up to August, 1942, 117,195 bags had been salvaged in a condition good enough to permit their return to the original shippers for re-use.

The point to note in the work done by the American Metal Co., Ltd., is that there is nothing unusual or high pressure about any of the tactics employed. The men responsible were able to get results by simply delegating responsibility to a few capable employees who were willing to do the job, and who did do it. It is an illustration of the value of having one definite agency in a plant to which all matters concerning scrap collection can be immediately referred. Unless this responsibility is made clear, scrap may be allowed to pile up in out-of-the-way places for lack of anyone on whom the burden of removing it may be placed. Action to that end, and surprisingly little action, too, is all that is needed to provide a more satisfactory response to the ever-growing demands for more scrap. Aid or suggestions in organizing scrap campaigns may be secured by writing E. J. Mulligan, Industrial Salvage Section, Bureau of Industrial Conservation, War Production Board, Washington, D. C.

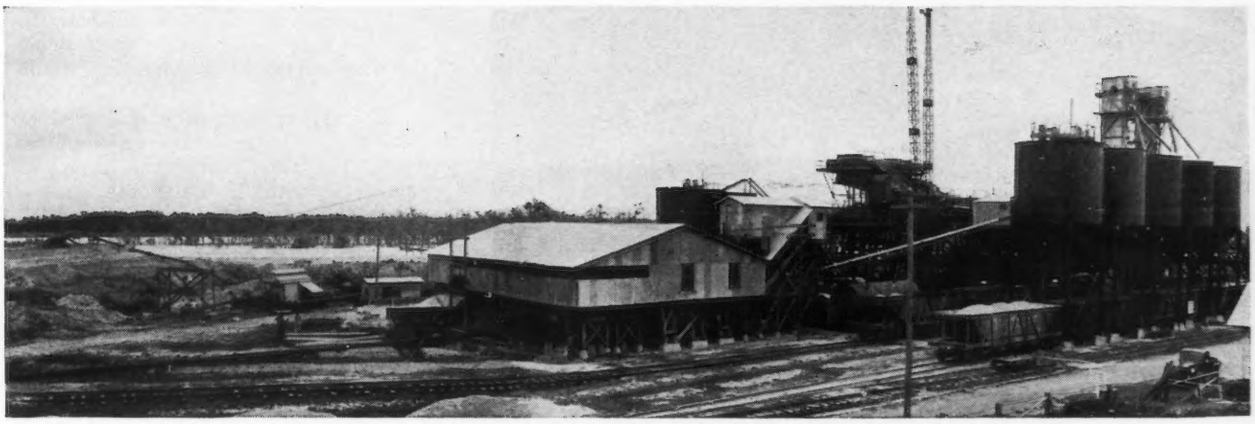
Monthly Scrap Collection at Carteret, N. J., plant of American Metal Co.

	February	March	April	May	June	July
Paper, lb.	9,695	10,325	14,960	17,015	12,885	.....
Rubber, lb.	.....	.....	.....	12,310	.....	1,950
Old, torn burlap bags and burlap, lb.	.....	8,860	16,660	11,450	5,000	7,365
Burlap bags fit for re-use, bags	.....	11,200	37,000	44,031	5,300	19,664
Old pipe, lb.	.....	.....	.....	4,225	.....	.....
Cast iron, lb.	99,980	.....	.....	.....	118,320	.....
Pipe and turnings, lb.	18,000	20,000	.....	24,445	.....	.....
Old steel drums and barrel hoops, lb.	148,640	77,440	68,145	64,360	.....	89,310
Miscellaneous iron, lb.	50,000	132,260	.....	219,760	5,170	33,200
Prepared steel scrap, lb.	.....	95,900	.....	84,080	.....	71,960
Broken graphite crucibles, lb.	.....	.....	.....	.....	.....	6,255
Granulated copper slag, cu. yd.	.....	649	9,085	14,883	3,197	3,169
Boiler-room ashes, cu. yd.	.....	3,433	1,557	595	47	.....

Total Scrap Collected, February-July, 1942

Old iron pipe, lb.	4,225
Cast iron, lb.	218,300
Pipe and turnings, lb.	62,445
Old steel drums and barrel hoops, lb.	447,895
Miscellaneous iron, lb.	440,390
Prepared steel scrap, lb.	251,940
Total iron and steel scrap, lb.	1,425,195
Paper, lb.	64,880
Rubber, lb.	14,260
Old, torn burlap bags and burlap, lb.	49,335
Burlap bags (fit for re-use) bags	117,195
Broken graphite crucibles, lb.	6,255
Granular copper slag, cu. yd.	30,983
Boiler-room ashes, cu. yd.	5,632

In addition to the above there had been collected and sold during the year 1941, 2,404,000 lb. of scrap iron and steel.



Coronet's belt-flotation plant is in the center of the picture, in the building with the gable roof. To the right is the Hopewell washer. In the distance at left is one of the storage dams for washer debris

Phosphate Washer Reject Successfully Concentrated on Moving Conveyor Belts

Novel flotation equipment used in Coronet company's re-treatment plant in Florida pebble field

A. H. Hubbell
Associate Editor

DEBRIS from the Coronet Phosphate Co.'s Hopewell washer,[1] 6 miles from Coronet, in the Florida pebble phosphate field, is re-treated in an adjacent plant which uses the flotation process in a novel way. After the conditioning step, the separation by flotation is effected entirely on moving conveyor belts, comprising three roughers and one cleaner, the phosphate particles passing off the sides of the belt and the unfloated residue continuing on the belt and falling off the end, in a manner that will be described. Two patents have been issued to the inventors, Dr. Ernest W. Greene and Robert M. Wilbur. These patents are now owned by Phosphate Recovery Corp.

The occurrence which suggested the idea that led to the development of the procedure and the equipment used was one of those things that "just happen." In this case it happened in the laboratory while "playing" with a pile of pulp that had been treated with reagents, when the effect of a jet of water impinging on the pile was noticed.

The first experiment was made by moving a jet across some pulp spread out on a board. The next was to try moving the pile through the jet instead of moving the jet through the pile. A short conveyor, 12 ft. between centers and having a 20-in. belt, was used to pass the pulp through a series of jets, the conveyor being operated by a motor and a variable-speed device. A good separation appeared to be impossible by this arrangement alone, so the idea was conceived of using stationary diagonal baffles on the moving belt to plow the pulp and turn it over and to deflect the unfloatable constituent riding on the belt and working towards the edges back to the center of the belt beneath the jets.

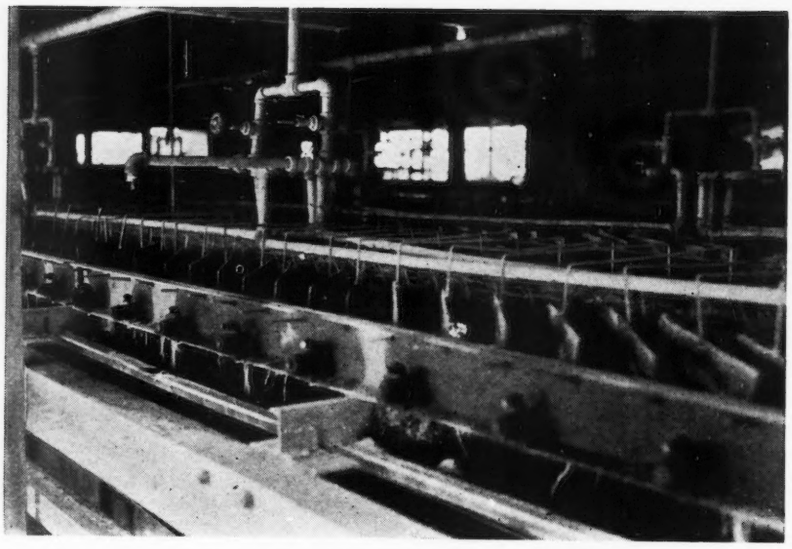
Equipped with baffles, the 12-ft. belt gave good results when the pulp was passed along it several times. The tonnage that could be handled was small, and a larger belt, 30 in. wide and 50 ft. c. to c., was tried. Bin capacity sufficient to run it several minutes was provided. The installation is described in Patent No. 2,047,773. A drawing that accompanies the specification is reproduced in Fig. 1. The belt was supported in a flat, level position by the horizontal members seen in the cross-section, Fig. 2.

Through the chute at one end, the feed, consisting of a fairly thick pulp of ore, conditioned as described later, was delivered to the belt. From apertures in the underside of the longitudinal pipes above the belt, jets of water were directed downward on to the bed of pulp. Sketches of the baffles used on this machine are shown in Figs. 3-5. These baffles dragged on the belt surface where they rested on it as it moved forward. The sheet baffle, Fig. 3, consisted of a piece of sheet metal attached to a $\frac{1}{4}$-in. metal rod bent as shown to clear the center of the belt. An angle of 20 to 45 deg. to the center of the belt was found to be best in operation for the baffles. The baffles thus arranged parallel with each other provided an unimpeded passageway for the pulp down the center of the belt.

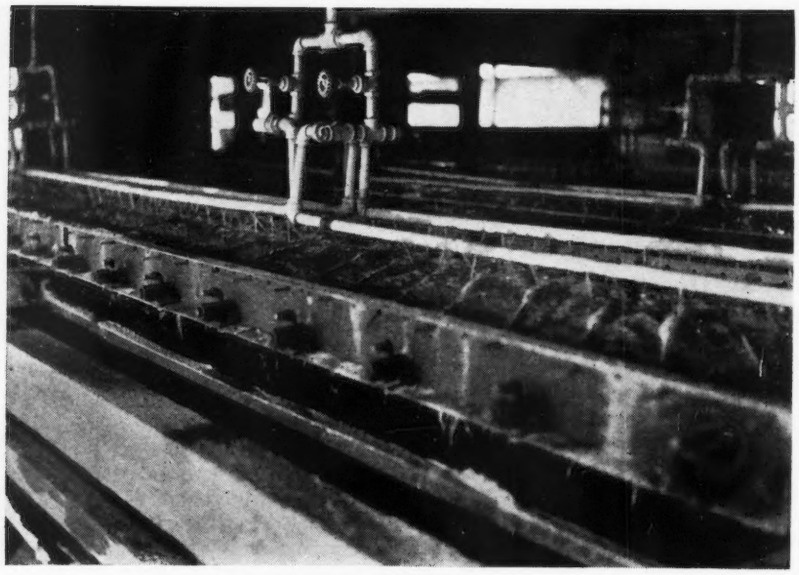
The functions of these baffles are, first, a plowing action, to turn the pile of "ore" over as it moves past them, and, second, a baffle action, to prevent the non-floatable constituent from being washed over the side of the belt and to guide it back to the center of the belt. The plowing action serves to stir up the ore particles in the water. The sheet baffle (Fig. 3) has been more effective in keeping the unfloatable material on the belt, whereas the rod baffles (Figs. 4 and 5) provide a better turning action. For roughing operations on this belt it was found desirable to equip the first half of the belt length with the sheet baffles and the second half with the rod type.

Spacing of baffles along the belt depends on the width and speed of the belt, the tonnage handled, and grade of product taken off. Six inches was

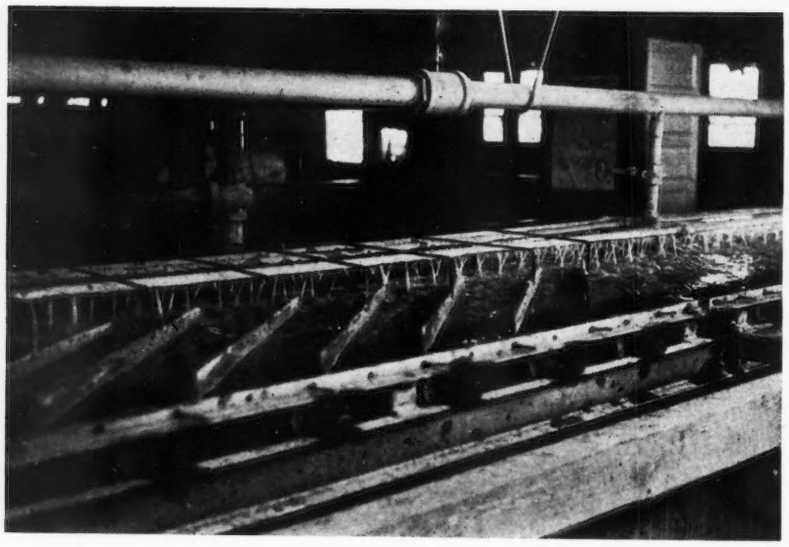
[1] Coronet's mining and washing operations were described in *E. & M. J.* December, 1940, in "Phosphate—the Vital Non-Metallic," by A. H. Hubbell. No mention was made of the then existent flotation plant. The term "débris" is used in the phosphate industry to denote the tailings from the washing and screening operation, as distinct from subsequent recovery operations.



Upper end of one of the three 70-ft. rougher belts, showing the sheet baffles and the water lines



Lower end of the rougher belt shown above. The rod baffles are seen



At the mid-point (approximately) of the cleaner belt, showing rod baffles at extreme right and, to the left of them, the sheet baffles

the spacing on the 50-ft. machine described, this giving good results under a wide variation of operating conditions.

The separating action is caused by the flow of water over the side of the belt. The water carries the phosphate particles with it while the gangue particles largely remain on the belt.

Roughing and cleaning tests had of necessity to be made separately on this 50-ft. belt machine. They were run on a deslimed, minus-0.032-in. tailings from a screening concentration of a Florida pebble rock. Reagents added prior to delivery of the feed to the belt were caustic soda, fatty acid, and crude oil. The water content was adjusted to give a thick pulp.

In one roughing test, 2,400 lb. of the chemically treated fines containing 36.28 percent B.P.L. (bone phosphate of lime) was fed at the rate of 24 long tons per hour. Belt speed was 72 f.p.m. Water was supplied at the rate of 245 g.p.m. Sheet baffles (Fig. 3) were used on the first half of the belt and rod baffles (Fig. 5) on the second half. Ninety-six percent of the phosphate in the heads was recovered as a 66.63 percent B.P.L. concentrate, constituting 52.2 percent, by weight, of the heads. The tails ran 3.06 percent B.P.L.

In one cleaning test made with similar baffles, 38 f.p.m. belt speed, and 217 g.p.m. water, 1,200 lb. of roughing concentrates running 60.64 percent B.P.L. was fed at a rate of 15 long tons per hour. Recovery of 87.2 percent of the contained phosphate was made in a 74.88 percent B.P.L. concentrate constituting 70.6 percent by weight of the heads.

On the strength of the results obtained with the 50-ft. machine, the Coronet company built a plant capable of handling 30 tons of feed per hour. This was expected to yield 8 to 10 tons of concentrate per hour, depending on the grade of feed. This plant had one 30-in. belt 72 ft. long between centers for roughing and a similar belt for cleaning. It was operated on material that was obtained from an old washer débris dump.

Reclaiming of the débris was started at the head of the dump where the launder had discharged and the material was comparatively coarse. As the operators worked down toward the periphery and got into a finer and poorer grade of material, it became evident that more roughing capacity was needed. An additional rougher belt of the same width and length was therefore installed. This plant produced approximately 120,000 tons of concentrate at an average rate of 10.4 long tons per hour. The plant with its three belts (two roughers and one cleaner) was moved up alongside of the Hopewell washer in 1939.

The next and most recent step in the evolution of the present plant was

simply an increase in capacity. Experience indicated that the proper ratio of rougher capacity to cleaner capacity would be three rougher machines to two cleaners. A third 30-in. belt 72 ft. long was installed on the rougher side of the plant. As to increasing cleaner capacity, question arose as to whether two 30-in. belts or one 60-in. belt would be better. No experience had been had with a belt wider than 30 in. To settle the question the 30-in. cleaner belt was treated as if it were one half of a 60-in. belt. One side was dammed and the water jet lines were shifted to that side. Baffles were correspondingly provided and arranged. Results were satisfactory. Certain additional advantages, moreover, were indicated for the wider belt. Little more than half the construction was necessary that would have been required for two 30-in. belts. Also, metallurgical results were better because the material had to travel further to reach the edge, so that there was a better chance of keeping the silica out of the concentrates.

Thus the present flotation plant consists of three rougher machines having 30-in. belts preceded by the conditioning agitators where the reagents are added, and one 60-in. cleaner machine. It will be described in greater detail in the following paragraphs. Ahead of the conditioners in the flowsheet (see Fig. 6) are the necessary items of equipment for preparing the feed.

Present practice in the Florida pebble field is tending toward the treatment of washer débris as it comes from the washer's current operations. This is not being done by Coronet, because it ties the operation of the recovery plant to that of the washer unless very large facilities for storing its feed are provided for the former to avoid the effects of variations in the deposit being mined.

Coronet's Hopewell washer has two storage basins near by, delivering to one while the débris from the other is being reclaimed for re-treatment in the flotation plant. The dump now being worked was completed six months ago. The stored débris is material which has passed through a woven-wire screen having a 0.028-in. opening. It varies in particle size from 14-mesh Tyler all the way down to slime. The phosphate content may vary from 20 to 40 percent B.P.L. A large part of the slime flows away at these storage dams, so that subsequent desliming is simplified.

This débris is mined hydraulically with two 6-in. Georgia Iron Works guns having 2-in. nozzles and water under 80-lb. pressure. These sluice it into the sump of a 12-in. G.I.W. pump, which sends it to a 40-ft. Dorr hydroseparator for desliming. This is driven at about 1 r.p.m. by a 5-hp. motor. Mining proceeds at the rate of 150 to 200 dry tons per hour. In the hydroseparator approximately 3,000 g.p.m. of dilution water is added. The underflow is pumped by a 10-in. G.I.W. pump to three 200-ton feed storage bins.

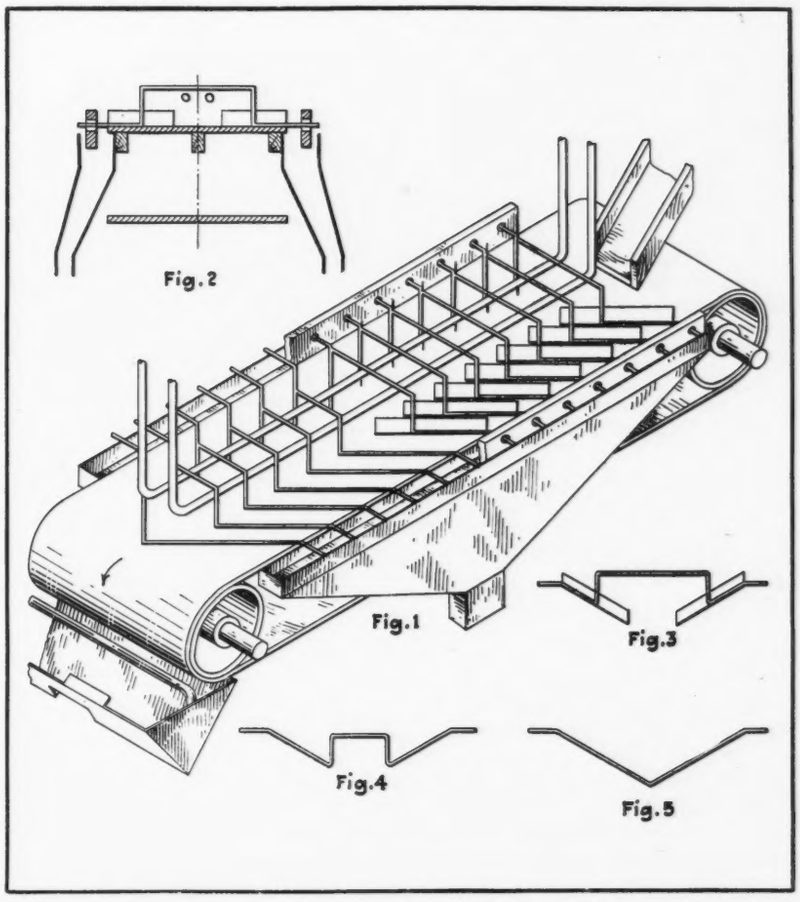
Delivery from these storage bins to the recovery plant is regulated by 4-in. stopcocks which feed a 6-ft. Dorr FX rake classifier by gravity. This classifier is at present being operated to retain the plus-100-mesh fraction as rake sands, the minus-100-mesh material overflowing to waste. Flotation cells were being installed at the time of writing and will probably treat not only this minus-100-mesh material but all material finer than approximately 48 mesh.

Rake sands from this classifier are delivered at 25 percent moisture to the conditioners where the reagents are added, ahead of the belt machines, at the rate of 30 to 50 tons per hour, depending on their grade, by a 20-in. conveyor belt inclined at 25 deg. to the horizontal and running at approximately 400 f.p.m.

The conditioners consist of an ordinary 20-ft. log washer followed by a 4x30-ft. rotary cylinder which is equipped with spiral conveying flights. The log washer requires about 15 hp. to drive it and the cylinder requires 20 hp. Conditioning time is about four minutes.

Conditioned feed is distributed equally among the three rougher belt separators. These are identical in construction and operation. Each consists

Figs. 1 to 5. . . Constructional details of the conveyor belt flotation machine



One of the two storage dams for receiving washer debris. The trestle-supported launder carries the debris to the pond. To the left can be seen the hydraulic reclaiming equipment and pipe line running to re-treatment plant

Dr. Ernest W. Greene

B. G. Dabney, manager, Coronet Phosphate Co.

of 30-in. conveyor belt, usually 3 ply, with a $\frac{1}{16}$-in. to $\frac{1}{8}$-in. rubber cover of medium grade. The belt runs at approximately 80 f.p.m. over 2-ft.-diameter end pulleys which are 70 ft. apart center to center. The conveyor is level. Between the end pulleys the belt travels on 3-in. cylindrical idlers having a $3\frac{1}{2}$-in. diameter sleeve at each end, giving the edges of the belt a $\frac{1}{4}$-in. rise above the center. Idlers are spaced 1 ft. apart center to center and run with homemade self-aligning babbitted bearings. Each bearing has an Alemite fitting.

Each sheet baffle on the rougher belts consists of two steel sheets $\frac{1}{8}$ in. thick by $2\frac{1}{2}$ in. wide by 18 in. long, positioned along each side of the belt at an angle of 45 deg. to the longitudinal axis of the belt. They are spaced 6 in. apart and extend from the outer edge of the belt to a point about 6 in. from the belt center, thus leaving a 12-in. open space between the ends of the baffles down the center of the belt. The function of these baffles, as previously explained, is in part to plow the unfloated particles back into the central area of action of the water jets. They are held in position by $\frac{1}{4}$-in. rods welded to them and anchored to stationary supports along each side of the belt.

These sheet baffles extend down the 70-ft. belt for 40 ft. Beyond them toward the tailing end of the belt, the belt is provided with $\frac{1}{4}$-in. rod baffles. These are bent in a V-shape (see Fig. 5) and rest on the belt with the apex of the V in the center. The velocity of the hydraulic water above these rod baffles is reduced by the use of valves.

Over the center of each belt lengthwise and spaced 6 in. apart are two $\frac{3}{4}$-in. hydraulic spray lines, drilled on the underside at 2-in. intervals with 3/32-in.-diameter holes. These pipes clear the belt by 5 in. Water under pressure varying from 8 to 20 lb. psi. (the pressure depending on the floating qualities of the feed) is delivered through these holes in jets impinging on the bed of feed that is on the belt conveyor.

Each roughing belt makes two products—a final tailing and a concentrate that requires cleaning. The tailing, carrying 4 to 8 percent B.P.L., is discharged over the end pulley into a common sump that runs beneath the ends of the three roughers. From here it is pumped to waste by a 6-in. G.I.W. sand pump.

Rougher concentrates made by each belt flow over the edge of the belt on each side into a launder paralleling the edge. These launders deliver into the tub of a dewatering drag having 4 ft. by 4 in. flights of $\frac{1}{4}$-in. steel bolted to a 20-in. rubber belt at 1-ft. intervals and working on a 30-deg. slope. The drag discharges to the head end of the 60-in. cleaner belt. These rougher concentrates contain from 60 to 65 percent B.P.L.

The cleaner belt, also 70 ft. long between centers, runs at approximately 65 ft. per minute. Aside from its width, it is similar to the 30-in. roughing belts, except also that it is equipped with four $\frac{3}{4}$-in. spray lines and has sheet baffles 36 in. long spaced 1 ft. apart. The rod baffles are exactly the same, except for length, as those on the 30-in. belts. This belt makes a middling product and a final concentrate.

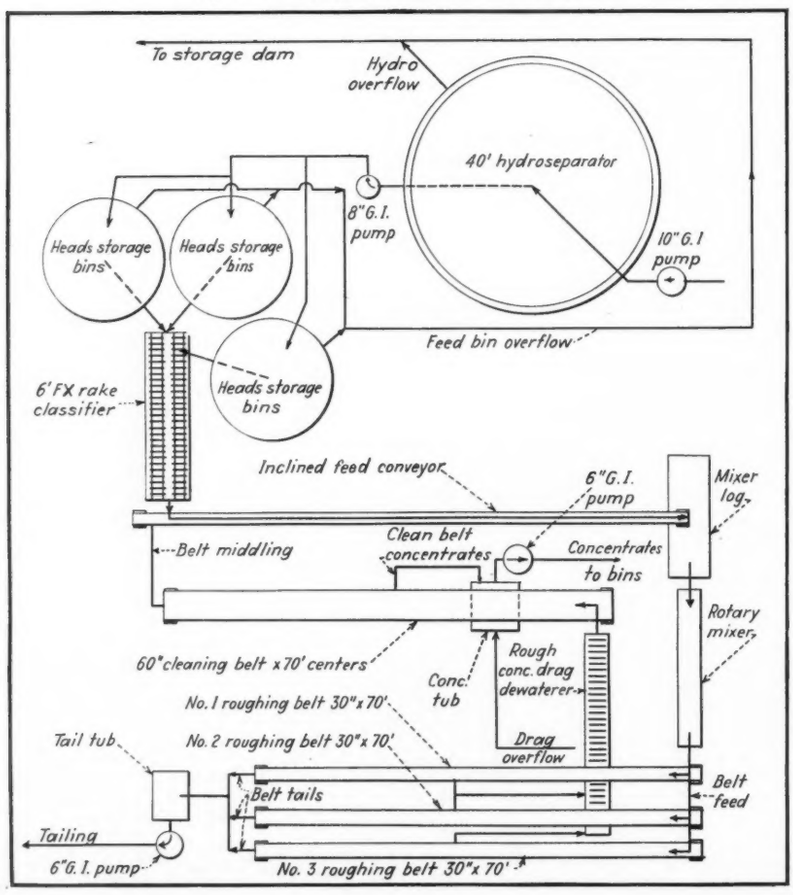
The middlings, running 35 to 40 per cent B.P.L., are discharged over the end pulley of the cleaner belt and are returned to the conditioners.

The cleaned concentrates are collected in a tub underneath the cleaner belt and are pumped by a 6-in. Georgia sand pump into 200-ton concentrate bins. From these bins they go by railroad either to wet storage or to the drying plant.

Output of this flotation plant, as it was at the time of writing, varies from 14 to 18 tons of concentrates per hour, depending on the feed. The concentrate is high grade, with 6 to 7 percent insoluble. Recovery in the unit averages between 85 and 90 percent.

Three men per shift (a shift foreman, a belt tender, and an oiler) suffice for its operation.

Fig. 6 . . . Flowsheet of the belt flotation plant



The United Nations' Newest Source of Iron

Geology, reserves, and plan for exploitation of Brazil's huge Itabira hematite deposits

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▶AS A PART *of the combined war effort of the United Nations, an agreement was recently reached among the United States, Great Britain, and Brazil whereby the Itabira iron ore deposits of Brazil will become available to steel plants here and in England. Terms of the agreement are essentially as follows: Export-Import Bank of the United States loaned Brazil $14,000,000 to finance development work, the loan to be repaid over 20 years at 4 percent at a rate of 15 percent of the price paid for the ore ($5 per ton) at the loading port in Brazil; output of the first three years of operation to go entirely to the United States and England, divided equally; initial production rate to be about 600,000 tons per year, but 1,500,000 tons per year expected as progress is made. Development of this enterprise will be of utmost assistance in realizing the long-cherished South American dream of establishing a basic iron and steel industry in South America. Playing as he did a large part in the exploratory and development work at Itabira, Mr. A. Malozemoff is thoroughly familiar with the enormous possibilities of Brazilian resources and has contributed the following description of economic and physical aspects of this tremendously rich storehouse of iron ore.*

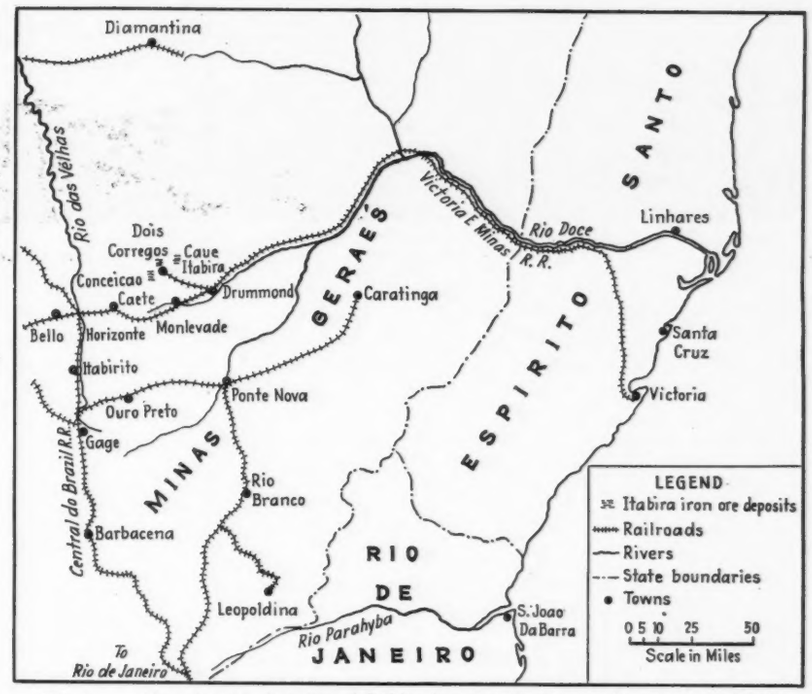


Fig. 1 . . . Map showing location of Itabira iron ore deposits and route of railroad to the port of Victoria

FOR THE PAST FOUR YEARS I have studied the problem of rational exploitation of the great Itabira deposits of hematite in the province of Minas Geraes, in Brazil, and have assisted the group interested in these deposits in planning their gradual development. That these plans have at last begun to materialize is due largely to the personal study of the matter by W. L. Pierson, of the Export-Import Bank, in Washington, D. C., and his technical staff. The fact that development of these resources of Brazil was made possible by financial assistance of the Export-Import Bank demonstrates Mr. Pierson's appreciation of the importance of the enterprise to the national economies of the three nations particularly concerned: Brazil, the United States, and England. Although exploitation of the deposits will be organized in a form somewhat different from that planned by the group for which I was consulting engineer, the essential character of the program, I believe, will proceed unchanged, and it may therefore be timely to follow the suggestion of friends in the mining business and submit to readers of *Engineering and Mining Journal* some of the information collected during four years of work on the Itabira ores.

Economic Background

To appreciate the potential value of Brazilian ores, it is necessary first to consider the present state of other sources of iron ore. As early as 1910, the International Geological Congress at Stockholm drew the attention of the world to the fact that iron ore reserves were limited. It estimated the total proved iron ore reserves at that time at 22,418,000,000 long tons with possible reserves of 145,795,000,000 long tons. Since the end of the war of 1914-1918, vast increases in the production of iron and steel have depleted these reserves much faster than could have been foreseen at that time. In consideration of the fantastic rate at which modern warfare swallows up steel, even greater demands for iron ore for war needs and in post-war reconstruction enterprises must be anticipated.

The United States has in the Minnesota and Michigan Iron Country one of the best of the world's readily available sources of iron ore. Between 80 and 90 percent of our requirements of iron ore come from the Lake Superior district. In 1937, out of the national production of 72,093,548 tons, the Iron Country produced 61,657,135 tons. However, estimates made in 1940 indicated that about half of the Mesabi Range's reserves of Class I ore—that is, ore containing 50 to 60 percent iron and 3 to 10 percent silicia—were used up and that about one billion tons, or 25 to 30

Caue Peak from the south, showing lack of overburden. The entire exposure is in solid ore

years' supply, remained.[1] Of Class II ore, 40-50 percent iron and varying quantities of impurities, most of which requires beneficiation, there remain about 1.3 billion tons. Of so-called Class III ore, iron-bearing rock carrying up to 25 percent iron, there is practically an unlimited supply, estimates having run as high as 60 billion tons.

C. K. Leith, the eminent authority on iron ore geology,[2] estimated in 1929 that the Mesabi range would reach its peak production between 1945 and 1950 and would thereafter decline as depleted reserves of high-grade ore forced the use of lower-grade less desirable ores. Consequently, Professor Leith added: "It does not appear probable that domestic readjustments will be adequate to meet the future requirements of the United States, except at much increased cost. This suggests that there will be larger imports of foreign ores, which at present amount to less than 4 percent of consumption."

E. W. Davis, of the University of Minnesota Mines Experiment Station, has calculated that at the rate of production demanded by our war effort, high-grade Mesabi ores will probably be exhausted by 1950.[3] "This means," he says, "that either a foreign ore supply of enormous magnitude must soon be made available, or that the low-grade ores of the Lake Superior district that exist in great quantities, especially on the Mesabi, but which are not now being utilized, must be developed and put into production on a very large scale." Mr. Davis adds that to accomplish this would require perhaps 80 large beneficiation plants costing $6,000,000 to $8,000,000 each.

Beneficiation may, of course, maintain the life of the Lake Superior deposits almost indefinitely as economical methods are found and perfected to utilize the low-grade, iron-bearing rock; but as costs rise under this necessity, more and more dependence will quite likely be placed on imported ores. As much as 3,000,000 tons yearly of ore have been recently imported into the United States, and we may expect to see this figure increase from now on.

Great Britain's steel industry is far more dependent than that of the United States on imported ore. Many famous deposits of iron ore, which for centuries had supplied England's steel industry, have long since passed their peak of production; and in the opinion of experts, many of them could no longer produce except in a price range which was not competitive even before 1939 and will not be in the predictable future. The important Jurassic ores of Cleveland, the Cumberland and Lancashire ores, and the Scottish Carboniferous ores have been exploited, of necessity, at a rapidly diminishing rate, so that their production before the present war was but a fraction of that obtained at peak activity. Although large orebodies containing about 30 percent iron were recently established in the interior of England, in Northamptonshire and Oxfordshire, they are rather far from the majority of England's steel plants, which are situated on the coast. These plants were, before 1939, already suffering from the progressive exhaustion of the older domestic sources, and of the Spanish mines, their principal foreign source of supply.

In Great Britain the importation of iron ore began about 1870, and has since risen steadily. In 1938, about one-half of the iron content in all the ores used in Great Britain came from Spain, Africa, Sweden, and other countries. C. K. Leith, in a paper which he presented to the World Engineering Congress at Tokyo in 1929, expressed an opinion that: "It seems likely that larger percentages of foreign ores will be used in the future if the British iron and steel industry is to compete successfully in foreign markets." In 1937, 6,995,-051 tons of iron ore was imported into the United Kingdom, for which £7,856,998 was paid.

Germany, before the war, likewise had to use low-grade ore in its very great iron production.[4] She had no large and rich domestic ore deposits and therefore worked many scattered, comparatively small orebodies in the East Rhine, Weser, and Thuringia districts. The most important domestic source was the Siegerland district, in the East Rhine, where the ore, occurring in veins, was a carbonate, requiring roasting, which contained 38 percent Fe and 6 to 8 percent Mn. In 1936 Germany mined not more than 9,000,000 metric tons of iron ore whose average grade ranged between 25 percent (Lahn deposits) to 53 percent of iron (Dellenburg deposits), with the greater portion carrying less than 40 percent iron. To augment domestic production in recent years, the powerful steel industry of Germany had to import foreign ores at a rate now over 20,000,000 tons a year.[5] Notwithstanding its well-known financial difficulties, Germany had imported iron ore from Sweden, France, Algiers, Spain, Morocco, and other

[1] Iron Mining, U. S. National Research Project. In cooperation with U. S. Bureau of Mines.

[2] Paper on world's iron ore supplies, presented to the World Engineering Congress in Tokyo, 1929.

[3] Report to WPB May, 1942.

[4] In 1937 steel production of Germany rose to 19,816,000 tons. (*Mineral Industry*, Vol. 46, p. 352.)

[5] According to "Deutsche Volkewittschaft."

countries, paying more than $5 (U. S. currency) per ton for high-grade ores. Other steel-producing countries in Europe, such as Belgium, Poland, and Italy, also to a great degree depended upon imported ores.

The principal exporters of iron ores in recent years have been France, Sweden, Spain, North Africa (French), and Chile. Iron-ore reserves in France were estimated at 8,164,360,000 tons in 1925, and possible additional reserves at 4,090,000,000 tons. Production in that year was about 39,296,000 tons of ore, of which a large part was exported to Germany, Belgium, and Luxemburg. But this ore was largely "minette" of Lorraine, from the districts of Metz-Thionville and Briey-Longwy, containing only about 35 percent Fe and 1.6 to 1.8 percent phosphorus. Because of its low grade it could be exported only to nearby German and Belgian steel works, which were especially adapted to smelt high-phosphorus ores such as the minettes.

Sweden was estimated in 1926 to possess ore reserves of 2,203,350,000 tons and possible ore reserves of 674,000,000 tons. These reserves are distributed between Grangesberg, Kirunavaara (Lapland) and Gellivara (Lapland). Because of the high iron content of these ores, 60 to 69 percent, they are in great demand, and Sweden exported in 1937 over 13,000,000 tons, about 80 percent of which went to Germany. The bulk of the ores are magnetites, however, and only the choicest of these, which constitute a small part of the total production and reserves, are low in phosphorus. It is conjectured that Sweden will attempt to curb iron-ore exports to conserve its natural resources.

Spain for many years was one of the principal exporters of iron ore to England and Germany. However, the quality and iron content of its ores have been falling off, and today it is difficult to obtain Spanish ore in large quantities with an average content of 50 percent Fe.[6] A typical analysis of Bilbao Rubio is: Fe, 47.2; Al_2O_3, 0.9; CaO, 0.3; MgO, 0.2; Mn, 1.0 percent.[7]

The great deposits of Newfoundland (Wabana, Great Bell Island), the actual reserves of which were estimated at 4,000,000,000 tons, are said to contain 48 to 50 percent Fe and 0.85 percent phosphorus. Many impurities and particularly high content of phosphorus restricts possible disposal of this ore in the international market. About 1,000,000 tons of this ore was exported yearly, principally to Germany, where it was used to produce high-phosphorus pig-iron for the Thomas process.

Substantial amounts of ore have been exported from the French North African colonies, Algeria, Tunisia, and Morocco. However, the ore deposits there are small[8] and are scattered over large areas; even more intensive production there than at present could satisfy only a small part of the international need for iron. The ores are comparatively pure, with low phosphorus and sulphur content and iron ranging from 51.65 percent (Diebal-Hata) to 62 percent (Mogda).

Large deposits of lateritic iron ore are known in northeastern Cuba. This ore is not rich in iron (about 40 percent), is high in moisture, requires sintering, and for the most part contains many harmful ingredients, such as chromium, nickel, and alumina, producing metallurgical complications. The ore is controlled by American interests and is exported in small quantities (about 300,000 to 400,000 tons) to the United States.[9]

Chile contains substantial iron ore deposits near Tofo, controlled by Bethlehem Steel Co. It exports more than 1,000,000 tons of this ore to the United States yearly, and that fact shows how modern transportation "can annihilate distance (over 5,000 miles), even with the handicap of Canal (Panama) charges."[10] The ore is magnetite of comparatively high grade, but it is not easy to smelt. According to C. K. Leith, it is unlikely that exports from these deposits could be maintained long on a much larger scale than at present.

A large iron-ore deposit near the mouth of the Orinoco River in Venezuela is now being worked by the Bethlehem Steel Co. It is expected that about 800,000 tons per year will be mined here for shipment to the United States.

Other great deposits—in Russia, Rhodesia, India, and other foreign regions—are either scarcely able to supply the iron industries of their respective countries, or are so poorly situated or contain ore of such poor quality that they cannot be regarded as possible competitors to the deposits described in the foregoing.

If the use of imported ores is studied in detail, the following main purposes of importation can be adduced:

1. To mix rich and pure imported ore with domestic ores, in order to bolster iron content in blast-furnace charges to about 50 percent Fe.

2. To supply old iron works situated near the seacoast with ore of suitable quality. Many of them were built on local iron ore deposits which became impoverished or exhausted.

3. To obtain rich ore free from harmful ingredients, such as phosphorus and sulphur, for special metallurgical purposes, such as production of high-grade alloy steels.

From all the foregoing it appears that demand for rich and pure ore will grow in the present great steel-producing countries as the quality of the domestic ores deteriorates. In view of the purposes for which they are chiefly used, imported ores of higher grade and purity will dominate the international market, and consumers will prefer them to lower-grade ores.

As more and more reliance is placed on imported ores, the conception that steel industries can exist only in countries which possess adequate deposits of iron ore and of coal suitable for metallurgical purposes must undergo a great modification. Ownership of vast ore and coal reserves is not required if a country is able to get them at an economical cost and in a form suitable from the metallurgical point of view. For instance, Argentina, which possesses neither large, economically situated iron ore reserves, nor ample deposits of coal of metallurgical grade, may, because she consumes about 2,000,000 tons of steel products per year, still find herself able to obtain the iron ore and metallurgical coal, at competitive economical prices, which will allow her to build up a national steel industry of her own. The evident trend among the young countries is in the direction of economic independence at least in the basic industries. This trend cannot be stopped in my opinion, and Brazil ore deposits may play a most important rôle in supplying, at economical prices, all the countries wishing to achieve independence in this basic industry. Brazilian iron ores, not only because of their enormous potential reserves, that could meet with complete

Interior of tunnel driven through massive hematite in Caue Peak

[6] *E. & M. J.*, Vol. 17, No. 7, 1926.
[7] Eisenhutte, *op. cit.*

[8] *E. & M. J.*, Vol. 17, No. 7, 1926. The estimates of reserves in Algiers is 100,000,000; Tunisia, 88,500,000; Morocco, 30,000,000 tons.
[9] "Minerals Yearbook," 1938, p. 496. Total imports of 488,419 gross tons of Cuban ores into the U. S. in 1937 were composed of 347,170 tons of hematite.
[10] C. K. Leith, *Ibid*, page 21.

adequacy the growing need of the world for iron ore, but also because of their great qualitative superiority, may be expected to assume a dominant position in the structure of this new world economy.

Itabira Iron Ore Deposits

Iron ore is abundant in many states of Brazil, but the largest and richest deposits thereof are those in the State of Minas Geraes. First described in 1815 by a German geologist, W. L. von Eschwege, these huge concentrations of iron ore cover an enormous area. According to studies and estimates made by the eminent Brazilian geologists, Dr. Luciano Jacques de Moraes, Dr. Octavio Barbosa, and Dr. F. Lacourt, of the Brazilian Department of Mines, the following probable tonnages of iron ore exist in this area of Minas Geraes[11]: 1,500,000,000 tons of hard hematite over 65 percent Fe; 3,500,000,000 tons of ore and "canga," 50 to 60 percent Fe; 10,000,000,000 tons of "jacutinga," 30 to 50 percent Fe—a total of 15,000,000,000 tons.

The principal deposits are in the central part of Minas Geraes around the headwaters of the Rio Doce and of Rio S. Francisco and can be divided into two great groups: (1) the deposits near the town of Itabira de-Matto Dentro, and around the upper tributaries of Rio Doce—the natural outlet for which would be the Port of Victoria, capital of the State of Espirito Santo; (2) the deposits around the upper tributaries of Rio das Velhas and Rio Paraopebo, which are reached by the Central do Brazil Railroad, the main line of which leads from the capital of the State of Minas Geraes, Bello Horizonte, south to Rio de Janeiro. To describe all these deposits would be entirely beyond the scope of this short article. I will limit myself to describing only those deposits around the town of Itabira whose development is now under way.

[11] Foreign Minerals Quarterly, July 1941.

Location—These deposits of high-grade iron ore lie near the town of Itabira de Matto Dentro, about 400 miles west of the port of Victoria (see map). The railway from Victoria, leading up the Rio Doce, was recently extended to the town of Itabira, but the character of the railway as yet renders it unsuitable for hauling large quantities of ore. This is the reason why the Itabira deposits remained for a long time untouched despite widespread interest in them.

The area surrounding the deposits is now controlled by Companhia Vale do Rio Doce, S. A., and consists of 2,020 hectares, distributed as follows: Conceicao, 1,452; Caue, 470; and Dois Corregos, 198. These three centers of deposition together make up one continuous crescent-shaped tract whose greatest length is about 9 miles and greatest width about 4.5 miles. The northern belt stretches around Caue Mountain and is the nearest to the present terminus of the railroad at the town of Itabira. The middle belt is Dois Corregos and the southern, Conceicao.

Each belt consists of a mountain or of a range of hills composed of various facies of iron ore, virtually free of overburden and almost denuded of vegetation. The altitude ranges from about 780 to about 1,280 meters above sea level, and the topography is in moderate relief. The belts are connected by good dirt roads.

The climate is subtropical, with a comparatively short rainy season. Annual range of temperature is about 23 deg. Fahrenheit between 78 deg. and 55 deg. The summer months, November to March, are also the rainy months, January being the wettest. From May to September, the weather is comparatively dry and colder. Clean, and for the most part rather open, the countryside is little troubled by objectionable insects and is free of malaria and other tropical diseases.

Administrative center of the district, Itabira has a population of about 5,000, who maintain a post and telegraph office, schools, and a hospital. Suitable labor can be supplied from the district, and, during our extensive construction, exploratory, and prospecting work, we never encountered any difficulty in obtaining good workmen. As the cost of living is low, the prevailing scale of wages has been correspondingly low; for common labor, for example, wages average 6 to 10 milreis per day (30 to 50¢ U. S.); for skilled workmen and for foremen 12 to 20 milreis (60¢ to a dollar).

Street in Itabira, administrative center of the district

Geology—For over a hundred years the iron-ore deposits of Minas Geraes have been studied by a succession of distinguished scientists of many countries, and by eminent engineers and experts commissioned by the Brazilian government and by industrial organizations. The labors of the French geologists Pissis (1848) and de Bovet (1883), the German geologists Hussak (1904), Gathmann (1913), von Freyberg (1927, 1932-1934), and Scheibe (1931-1933), the English geologists Scott (1902, 1917) and Richards (1902), and the American geologists Leith, Harder, R. Chamberlin, Derby, and many others (including C. M. Weld, of Weld and Liddell) have thrown much light on these famous deposits.

Practically all the geologists who have studied the Itabira iron-ore deposits agree that the ore represents a profoundly metamorphosed mass of material originally sedimentary in character. Deposited in Pre-Cambrian times as an oölitic ironstone, these

sediments were highly altered as a result of dynamic and hydrothermal metamorphism. The precise mode of origin of the oölites has not been agreed upon, but their enormous extension has been firmly established by our work as well as by that of others who have examined them.

During a very early epoch, probably also of Pre-Cambrian age, all the sediments of the region were intruded by magmatic injections which converted them (including the sandy facies associated with them) into material of a crystalline metamorphic facies. From the study of the region it is quite apparent that further important changes occurred because of tectonic disturbances. It is considered that during these latter, the process of dynamic metamorphism had full effect, completing reconstitution of the one-time sediments into rocks of a schistic and granulitic suite. When the tectonic disturbances subsided, the region assumed a stable form, and after subsequent erosion it now appears as a rugged terrain composed of iron beds and associated rocks tilted into various attitudes, with the most resistant rocks well exposed at the higher elevations. Over side areas in the district, the present topography is developed into hills and ranges of iron ore of various facies.

The three parts of the property—Caue, Conceicao, and Dois Corregos—have the same general geological character. All of them show great outcrops of solid hematite ore surrounded by ore-breccias which are locally called "canga," and in places by banded iron ore with laminæ of quartz and sometimes clay which is locally called "jacutinga."

The origin of the mantle of ore-breccia covering great portions of the property can be readily understood. This, as is agreed by all the geologists, is secondary ore formed by the cementation of fragments of solid hematite ore with hydroxides of iron. It should be expected that this mantle overlies and conceals great masses of solid hematite and soft ores. The exploratory work conducted by Itabira Iron Ore Co., Ltd., predecessor of Companhia Vale do Rio Doce, proved this many times over.

To explain the origin of the "jacutinga" is more difficult. Perhaps this rock represents the lower layers of the original iron beds, which were particularly affected by the action of magmatic emanations and into which were injected magmatic solutions that deposited layers of quartz and other minerals in them. It would be hard to explain otherwise the presence of gold and other metals and some of the minerals in the "jacutinga."

To reveal the true character of the deposit and prove conclusively that under the mantle of "canga" exist great bodies of solid and soft ores, extensive exploratory work was carried out under the direction of the engineers of the Itabira company. In all, about 11 km. of tunnels were driven in various parts of the property, and in every case the tunnels were driven in ore through practically their entire length. In addition to hard hematite ore, large quantities of soft ore consisting of fine, powdery hematite were revealed. This soft ore probably represents the hematite pulverized in part by tectonic movement and in part weathered out from the hard ore.

This exploratory work has been so complete as to permit an accurate appraisal of the chemical nature of the four types of ores of which the deposit is composed—namely, hard ore, "canga," "jacutinga," and "soft" ore. Table I provides average chemical analyses of these types of ores.

Table I—Average Analyses of Itabira Iron Ores

Ore	Sample	Iron, Percent	Phos., Percent	Sulphur, Percent	Total Insol., Percent
Hard ore	Average of 160 groups of samples taken over 2,045 meters of tunnels, each group containing 20 samples taken at 0.5 meter invals	68.8	0.01	0.02	1.32
"Canga"	Average of 16 groups of samples from different parts of the property	61.9	0.06	0.04	0.35
"Jacutinga"	Average of 92 groups of samples taken over 2,614 meters of tunnels	49.1	0.01	0.01	28.88
"Soft" ore	Average of 44 groups of samples taken over 1,461 meters of tunnels	68.18	0.017	0.0222	2.17

These assays of the Itabira Iron Ore Co.'s engineers were checked by Mr. C. M. Weld, who carefully sampled the tunnels. These check samples were then analyzed by Andrew S. McCreath & Son, analytical chemists, Harrisburg, Pa., and the results corroborated the sampling and assaying reported in Table I.

McCreath & Son considered as typical the following analysis of the ore:

Fe_2O_3	85.280
Fe_3O_4	14.290
SiO_2	0.114
Al_2O_3	0.226
Mn_2O_3	0.060
SO_2	0.047
P_2O_5	.027
Total	100.044

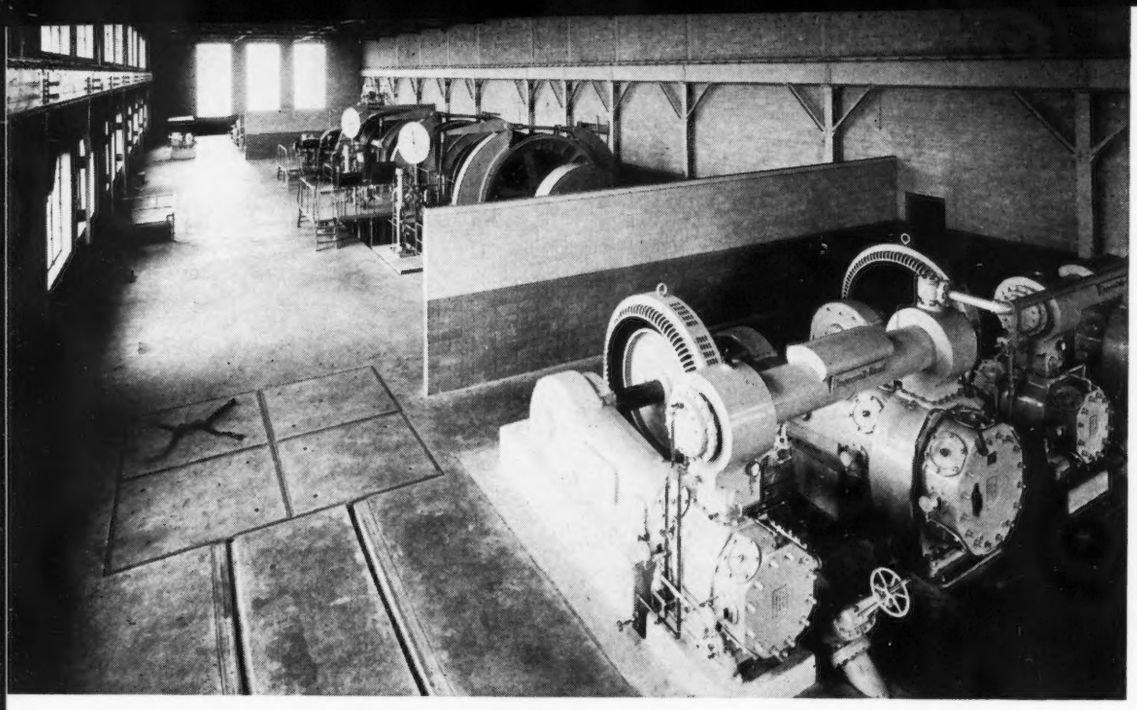
The remarkable richness of the Itabira iron ore, approaching the theoretical limit of iron in the mineral hematite (70 percent iron, 30 percent oxygen), and particularly its freedom from titanium, copper, phosphorus, and sulphur, make this ore admirably suited for the manufacture of high-quality steel products. The fact that this ore is a hematite, easily reducible in the blast furnace and far superior in this respect to magnetite, which is the prevailing ore in Sweden, Chile, and some other exporting countries, places it in a privileged position in the international markets for iron ore.

As may be seen from the preceding description of the ores used by the great steel-producing countries of the world, all the facies of iron ore present in the Itabira district can be called good commercial ores. The poorest of them, "jacutinga," contains about 50 percent of iron, about equal the average content of the ores used by American industry and by far exceeding the average content of ores used by British, German, French, and Belgian producers.

"Canga" must be classified as a high-grade iron ore along with the hard ore, which, as explained in the foregoing, is practically pure mineral with massive structure. Even the fine ore, which is virtually all minus-100 mesh, represents a high-quality product, which, when sintered, would be quite suitable for use in blast furnaces.

(To be concluded)

North side of Caue Peak

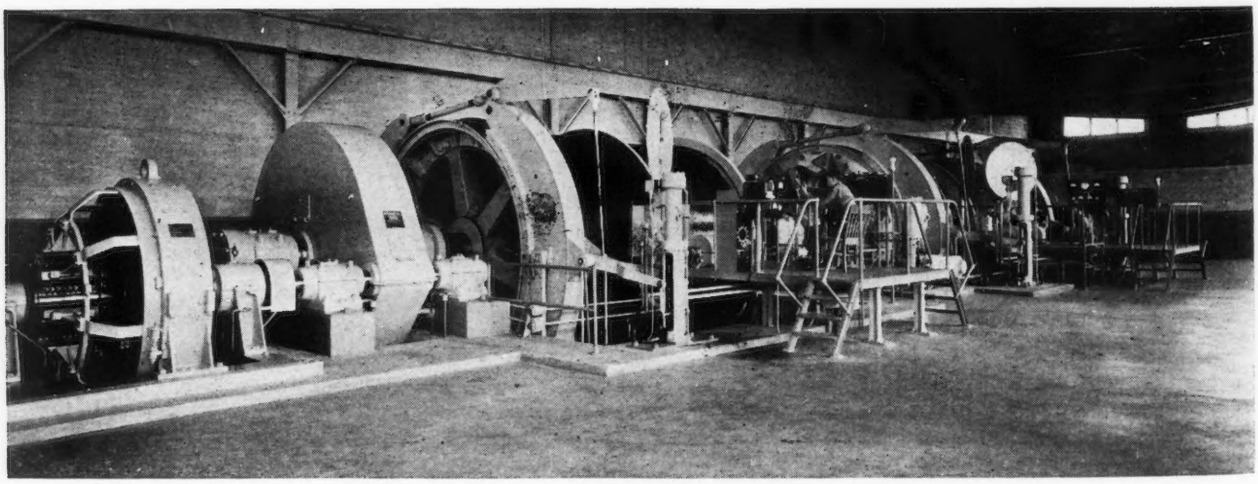


Main machine room, showing air compressors and hoisting equipment. In the structural framing of this building, 60-ft. welded steel trusses were used. Removable floor slabs in the foreground permit lowering electrical equipment to the basement. Note the intercepting partitions which serve to break up air currents or vibration caused by the operating machinery

One end of the warehouse at the Mather mine. The maintenance shops are located along the left wall and receive supplies directly from the warehouse

Mather Mine Presents

SURFACE FACILITIES approaching luxury in quality have been erected at the new Mather mine of the Negaunee Mine Company near Ishpeming, Mich., which is owned jointly by Cleveland-Cliffs Iron Co. and the Bethlehem Steel Corp. Occupied at present only by the shaft-sinking crew, the change house, shops, and offices will provide every convenience for the 1,000 or more men who will eventually work in the mine. Details of construction are given in the accompanying photographs, which were furnished by the

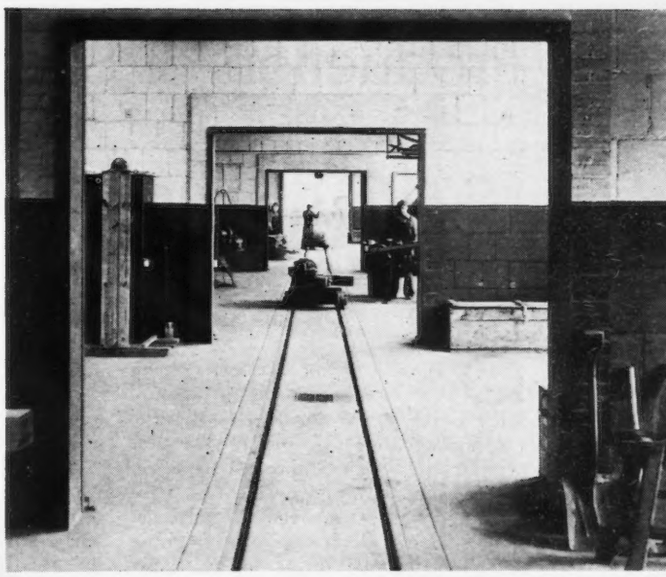


Close-up of the Nordberg Mfg. Co. hoisting equipment, the cage hoist in the foreground. Both hoists are Ward Leonard controlled and also make use of the G. E. Amplidyne control system

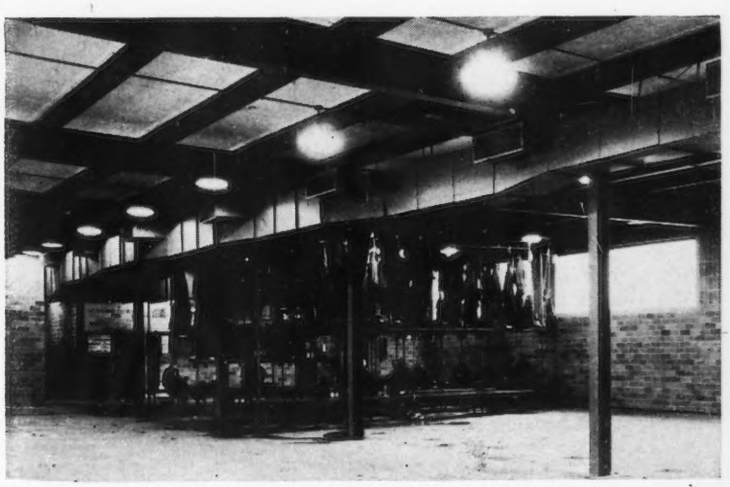
Air-conditioned office building and mine. Two 12-ton skips will operate in balance in this shaft and crews will be transported in a 75-man double-deck cage

Its New Surface Plant

Austin Company, engineers and builders, who designed and built the several structures, with the exception of the headframe, which was erected by Worden-Allen Company. Further details of the Mather mine operation were given in an article by A. H. Hubbell which appeared in the October, 1941, issue of *Engineering and Mining Journal*. S. R. Elliott, of Ishpeming, is manager of Cleveland-Cliffs' mining department, and C. W. Allen is superintendent of the Mather mine.

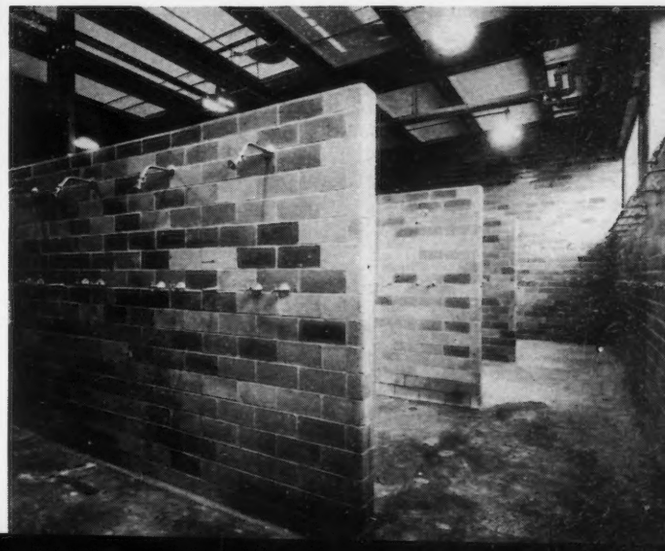


Maintenance wing of the surface buildings. View is from the carpenter shop, through the electrical shop and the machine shop, into the blacksmith shop



Dirty-clothes room in the change house. Sidewalls are of salt-glazed tile and windows are of glass blocks. Air conditioning units maintain proper interior temperatures the year round. Racks and shelves have thus far been provided only for the shaft-sinking crew

Shower room in the change house, which provides space for 130 miners. Walls are of salt-glazed tile; brass footrails were yet to be installed; liquid soap dispensers are provided between each pair of shower nozzles



Wide World photo

Preparing sheet mica at a mine near Spruce Pine, N. C.

Federal Agency Stimulates Production of Strategic Mica

Many mines in North Carolina are taking advantage of assistance offered

SEARCH for strategic mica and its production have been stimulated in western North Carolina since the Colonial Mica Corp., agent for Metals Reserve Co., was created last spring. The new organization was established as a result of joint planning by the War Production Board and the Reconstruction Finance Corp. for the purpose of increasing the supply of mica for military electrical equipment.

This government-owned non-profit corporation, set up by the RFC, seeks to get more mica of the desired grades mined by whatever methods appear necessary. To this end it insures a market for all of the strategic punch and sheet mica that can be produced, at encouragingly high prices. For standard No. 1 quality North Carolina trim mica, the prices quoted run from 30c. a pound for punch and $2.40 per pound for 1½x2-in. sheets up to $9.12 per pound for 6x8-in. sheets. For each size there is a price range from 10 percent below to 25 percent above the price quoted, depending on quality, preparation, and class. The prices are expected to stimulate greater output.

In addition the Mica Corp. loans mining equipment at low rentals to companies and individuals that, on investigation, appear competent to use it effectively in boosting the output of mica.

After providing a warehouse and offices in the Asheville region to serve the mica miners of the Southeastern States, the Colonial soon opened a field office in the Spruce Pine area.

One of the largest groups of active mica mines in this region is that of E. L. Briggs, of Burnsville, N. C., who holds 1,100 acres in Mitchell and Yancey counties. Leasing some of the properties and working others, he has found the Elmyra Gibbs vein, in Yancey County, especially productive. On it there are several active mines now under lease to various companies. Elmyra Gibbs No. 1, operated by Capital Minerals Corp., has been yielding heavily. The force employed consists of 7 men in the mine and 11 women in the sheeting house. The mine was originally opened in 1915. Work was started on No. 2 by the same company late in September. Nos. 3 and 4, worked by Industrial Minerals Corp., of Asheville, are new mines on the vein and have been turning out No. 1 ruby mica and clear water-pattern in sheets up to 4x6 in. in size.

Another company leasing from E. L. Briggs is Meyer & Brown Corp., of New York, operating the White Oak Creek mine, in Mitchell County, first worked in 1880. This company produces a high grade of ruby rum mica here, also from the Randolph mine, in the same county, in which operations were started as long ago as 1870. The mica, with that from the Presnell mine, is prepared for market in the company's warehouse.

With S. M. Edge, E. L. Briggs owns the Lighted Rock mine, in Yancey County, which is leased to Ensley, Banks, and Wilson, resident operators. This was opened many years ago. Other properties held by Mr. Briggs are available for leasing. These include the Dink Rock, the John Thomas mines, and the Duck Branch mine. The Blaylock Rock mine, in Yancey County, has in the past produced a large amount of No. 1 clear mica.

Deer Park mine No. 5, operated by United Feldspar & Minerals Co., is the deepest mine producing mica in the Spruce Pine region. It has been worked more or less continuously for 60 years. For many years it has been a producer of feldspar also. The English Mica Co., which grinds mica in four plants, is also a producer of sheet mica. Victor Mica Co. is working the Sink Hole mine, which is said to have a record dating back to 1866.

Other mines are the Horton Rock and the Ed Buchanan, worked by Buchanan Brothers since July. These are 7 miles from Bakersville, in Cane Creek County. From the Ed Buchanan, 6x8-in. pattern mica has recently been taken out. Ed and Albert Young are operators of the Harding Mines, on Shoal Creek, producing red rum mica. They are credited with a notable output during the summer months. The Putnam mine, in Mitchell County, opened in 1934, is being worked by Hensley, Gouge, and Silver.

On Chalk Mountain, Burleson mine No. 8-A, also opened in 1934, is being operated by the Whitehall Company, A. C. Tainter manager. Steve Sparks is superintendent. The Westall mine, on Colbert's Creek, in the National Forest, is under lease from the government to Arthur Patton, who is now cleaning out the workings. Patton and McBee have leased the Klondike property to Harry Bone. It was last worked 40 years ago. It also produces red rum mica. In August the Star Mining Co. began work on the Thad Young property.

Another prospective source of mica is afforded by the Heap and Clapp properties, among which is the Sink Hole mine, previously mentioned. The Meadow mine, owned by Mrs. Waites Avery, Sr., is a producer of black mica.

Other properties could be mentioned. The list is steadily lengthening. The plan, already noted, of leasing suitable equipment at low rentals is evidently stimulating interest.

An Arkansas Travelogue

With the benefit of wartime demands, Arkansas mining is being rejuvenated

Evan Just
Assistant Editor

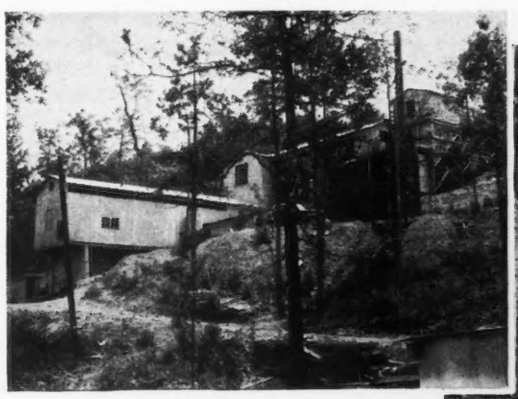
THIS TRAVELOGUE begins at Murfreesboro, in southwestern Arkansas, best known prior to the discovery of quicksilver for the diamond mining which was done in the vicinity several years ago. Wartime conditions have led to a revival of interest in diamond mining, although no productive operations are yet under way. At present the North American Diamond Corp. is making a survey of the diamond deposits, with a view to resuming production. The older mining was strictly a surface operation. The surface of the diamond-bearing peridotites was weathered to clay, which was dragged to a washing plant, where the material was washed and sluiced. Diamonds of gem quality were among those produced in this operation.

The quicksilver deposits of Pike and Clark counties, 7 miles north of Murfreesboro, were discovered in 1930-31,[1] the mineral being identified by W. M. Weigel, geologist for the Missouri Pacific Railroad. Mining activity dates from that time, the discovery having aroused immediate interest.

Cinnabar is found in a belt approximately 1½ mi. wide and 30 mi. long, extending entirely across the middle of Pike County and nearly halfway across Clark County. The strike of the formations is N. 80 deg. E. The country rocks consist of the Stanley shale, Jackfork sandstone, and Atoka sandstone, all of which are of Pennsylvanian age, each being approximately 6,000 ft. thick in normal section. All these formations are compressed into close folds of the Appalachian type by deformation of mid-Pennsylvanian time, which built the Ouachita Mountains. Thrust and oblique faulting accompanied the folding. The dip of the quicksilver-bearing rocks is approximately 80 deg. to the south. Most of the quicksilver mineralization occurs in sandstone members in the upper part of the Stanley shale, with some in the Jackfork sandstone, which borders the area on the south. Throughout the length of the area, the Stanley shale is thrust over what some authorities[2] believe to be the Jackfork sandstone, and which another authority[3] believes to be the Atoka formation. In either case a major thrust fault is indicated. The principal quicksilver deposits are close to this fault. A few oblique faults of moderate displacement have been found, and a host of small faults, striking in all directions, exists all over the area. Most of the quicksilver is found in a few prominent sandstone members of the Stanley shale, which occur stratigraphically between 1,000 and 1,500 ft. below the top of the shale. The most prominent of these, about 300 ft. thick, is known as the Gap Ridge sandstone. Another prominent member, 100 ft. thick, is called the Parker Hill sandstone.[4]

The cinnabar occurs typically along intersections of minor faults with shale seams in the sandstone, the shale forming the hanging walls of the orebodies. Other structural traps, such as drag folds and fault intersections, also localize mineralization. In general, the larger faults are not mineralized; however, the nearness of the principal known orebodies to large faults suggests that the latter acted as trunk channels of circulation for the ascending mineral-bearing solutions, which deposited their burdens along tributary watercourses formed by the minor structural traps. Possibly this situation is due to the circumstance that the larger amount of hot-water circulation along major fissures raised their temperature to the point where quicksilver deposition was impossible, except at levels above the present surface, now eroded. Most of the cinnabar is deposited along small to minute fractures. Even what is disseminated ore in small specimens is within a few inches of mineralized fractures. Other minerals genetically associated with the cinnabar are dickite (more abundant than cinnabar), quartz, stibnite, pyrite, and marcasite. None but cinnabar are of economic significance. Rarer quicksilver minerals also occur, including native mercury and metacinnabarite, but not in important quantities.

The first discovery was made at Parker Hill, just west of the Little Missouri River. Another discovery was made almost simultaneously some 15 miles to the east, where Antoine Creek crosses the mineralized belt. The pioneer mining operation was established by Leo Yount, a mining engineer and geologist then living in Little Rock. Yount came to the district as soon as the find was made public and obtained mining rights on several pieces of ground near the Little Missouri River. On these were established the three principal mining operations of the Southwestern Quicksilver Corp., the Parnell Hill, Parker-Hill, and Gap Ridge mines, under the direction of Noel H. Stearn, geologist for W. C. McBride, Inc., of St. Louis, Mo. A 12-ton Gould rotary furnace plant was built at Parnell Hill, just east of the Little Missouri, which handled the ores from all three mines. Later Yount erected a two-tube retort furnace just west of Antoine Creek, which handled ores mined at several open cuts in the vicinity. This operation was conducted under the name of Arkansas Quicksilver Co. In 1935 its properties were sold to the Midcontinent Quicksilver Corp., which built a 50-ton multiple-hearth furnace late in



95-ton reduction plant of Humphreys Gold Corporation

Parker Hill mine of Arkansas Quicksilver Company

[1] Weigel, W. M.: "New Quicksilver Discoveries." *E.&M.J.*, Vol. 132, pp. 495–497; 1931.

[2] Hansell, J. M., and Reed, J. C.: "Quicksilver Deposits Near Little Missouri River, Southwestern Arkansas." *Trans* A.I.M.E., Vol. 115, pp. 229–246, 1935.

[3] Stearn, Noel M.: "Cinnabar Deposits in Southwest Arkansas." *Econ. Geol.*, Vol 31, pp. 1–28, 1936.

[4] This may be improperly named. R. B. McElwaine, of the Arkansas Quicksilver Mines Co., believes that Parker Hill is composed of Gap Ridge sandstone.

"Making" outcrops with a bulldozer

Drilling and loading barite near Magnet Cove

the same year and operated until 1938.

About a dozen mining operations sprang up in the years 1931-35, all of which except the two mentioned in the foregoing were small prospects and small retort plants. None of them survived. Until 1941 the operation of the Southwestern Quicksilver Co., which shut down in 1934, was the largest in the district. This company mined its Gap Ridge mine, an open cut 60 ft. long and 6 to 8 ft. wide, to a depth of 225 ft. Parker Hill mine, principally a small open cut, was mined to a depth of 130 ft. Parnell Hill mine, the largest of the three, consisted principally of three open cuts and three shafts, the deepest being 187 ft.

From 1936 to 1938 activity in the district slumped to almost nothing. At one time during this period R. B. McElwaine, a geologist who entered the district in 1935 and has been producing up to the present time, was the only producer. In 1938 McElwaine and Yount leased the properties of the Southwestern Quicksilver Co. and resumed operation of that company's furnace and mines as the Arkansas Quicksilver Co. The capacity of the furnace was increased to 20 tons. Gap Ridge mine was reopened and a mineralized slab a few feet thick removed from the south wall. The company's principal operation has been at Parker Hill. Three orebodies were developed in this mine. The most prominent has been mined to a depth of 500 ft., the deepest operation in the district. Present plans are to develop this orebody to the 600 level.

Big Six Mining Co., which entered the district in 1937, now has a 30-ton rotary furnace plant about two miles southwest of the Little Missouri crossing. Its property was developed by sinking a 200-ft. shaft in a small valley about 100 ft. below a hilltop where cinnabar-bearing sandstones outcropped, and driving a crosscut which intersected these sandstones about 300 ft. below the outcrop. Operations are now shut down but not abandoned.

In 1938, the Caddo Quicksilver Co. started an operation about four miles east of Antoine Creek. This company installed a 15-ton rotary furnace and mined one of the richest orebodies yet found in the district to a depth of 225 ft. Its horizontal dimensions were 120 ft. long and 12 ft. wide. The operation is currently shut down.

In addition to the activities mentioned, the principal operations now producing are United States Mercury Co. (15-ton rotary furnace), the National Quicksilver Co. (15-ton rotary), and the Humphreys Gold Mining Corp. (95-ton rotary). About half a dozen small retort plants are also in operation. Three rotary furnaces, Superior Mercury Mine (15 tons), Jean Holmes (12 tons), and Ajax Quicksilver Co. (5 tons), are shut down. The Ozark Quicksilver Mining Corp. is examining properties in the vicinity of the idle multiple-hearth furnace of Midcontinent Quicksilver Corp. with a view to resuming its operation.

The Humphreys Gold Corp., of Denver, Colo., entered the district in the summer of 1941, and started operations just east of Antoine Creek in a mineralized area which had been mined by a few shallow open cuts some years ago by the Arkansas Quicksilver Co. The 95-ton rotary furnace erected by this company is the largest in the history of the district, as is also the scale of its mining operations. Under the local management of Jay P. Wood, of Denver, Colo., formerly engaged in gold dredging on the Klamath River in California, and with P. W. Racey, of Oakland, Calif., as consulting engineer, this company is now producing from three mines and has two more under development. Currently, the reduction plant is handling ore with a mercury content averaging about five pounds per ton.

The Humphreys 34-1 mine has developed the largest single orebody in the district. Its maximum horizontal dimensions are 30x100 ft. It has been mined for a vertical distance of 175 ft. and is still persisting. The stope is carried open and is supported by well-keyed, strong square-sets. Most of the other larger orebodies in the district are mined by shrinkage stoping.

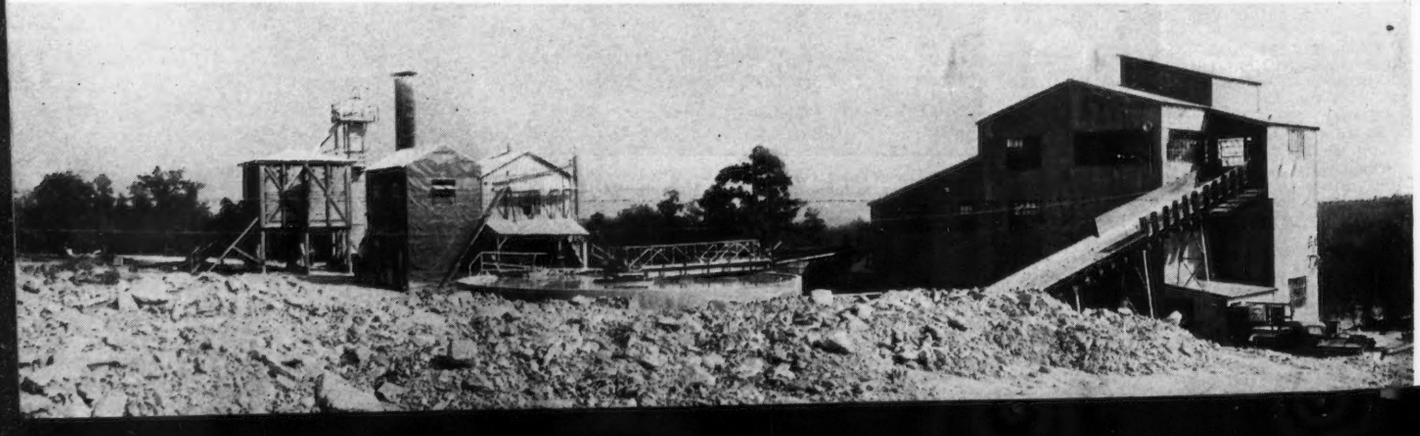
A difficulty attendant upon quicksilver mining in this district has been due to orebodies being small, irregular, and discontinuous. Even the better ones found in the past have not yielded sufficient rewards to cover the cost of mining and development, plus the cost of discovering sufficient new ore to offset depletion. The Humphreys company is seeking to overcome this handicap by undertaking larger-scale operations and by close study of surface mineralization and associated structural conditions.

A handicap to prospecting is created by the forest and soil cover which obscures most of the mineralized area, so that only scattered outcrops assist the prospector. Mining profits are too small to finance a systematic penetration of the overburden by test pitting or trenching. The Humphreys company is using bulldozers to expose strips of areas considered to be promising. This system has been in operation too short a time to determine if it will pay its way.

Outside of the Humphreys contribution, it seems likely that the total production of other operations is headed for a slump unless prices increase or something is done to improve prospecting methods. Development of orebodies already known would probably be aided by judicious use of underground diamond drilling. The nature of the mineralization and the complicated structure do not augur well for the successful use of known geophysical prospecting methods. No one has yet tried out soil analysis for mercury content as a means of limiting areas on which to prospect more intensively.

The next stop was a visit to the barite mines and plant of the Baroid Sales Division of the National Lead

Barite mill of National Lead Company



Co., near Malvern, in Hot Springs County. This property is close to Magnet Cove, well known geologically for its occurrences of nepheline syenite. The "cove," a basin-shaped valley, is deemed to be the site of ancient volcanic activity, and the barite mineralization is thought to have emanated from this source. The barite deposit now being worked occurs as one of the beds near the end of a canoe-shaped synclinal fold, the axis of which strikes east-west and plunges from east to west. At the mine the south limb of the fold is approximately vertical. The north limb dips at about 40 deg. The bottom of the fold at the mine is 200 ft. deep. In the operation noted, the barite seam is 40 to 75 ft. thick. It replaces beds in the Stanley shale formation (Pennsylvanian), presumably of shale, as the impurities remaining in the barite are clay, apparently remnants of unreplaced shale. The hanging wall is of shale. The footwall is the Hot Springs sandstone, a 50-ft. member of the Stanley shale formation.

The mine is an open cut about 500 ft. long, excavated entirely in the barite seam after stripping of a thin overburden. A 20-ft. cut is made in the barite, exclusive of overburden. For the first cut it is not necessary to remove any of the shale wall, but because of its incompetence it will be necessary to cut benches in the shale with successive cuts in the barite, in order to preserve an angle of repose.

Although the barite is rather soft, it is firm enough to require light blasting before shoveling. Blast holes of $2\frac{1}{2}$ in. diameter are drilled with a small churn drill manufactured by the Hossfield Mfg. Co., of Winona, Minn. The barite is loaded with power shovels into trucks, which haul it a short distance to the mill. At the mill the crude barite is placed in a stockpile which serves to furnish a reserve supply for winter, when continuous mining operations cannot be carried on conveniently.

The mill, rated at 250 tons per day capacity, is electrically powered. Crude barite is dragged up an incline and fed to a jaw crusher, which reduces it to 1-in. size. The feed is then passed through rolls, which bring it down to $\frac{1}{2}$-in., and then to a Bendelari jig, which raises the tenor from 80 to 85 percent barite. Jig tails are discarded. The jig concentrate is fed to a ball mill in closed circuit with a Dorr bowl-type classifier, which reduces the material to 2 percent plus 325 mesh. This product is pumped to a Dorr thickener, which conditions the feed for a six-cell Denver Sub-A flotation machine rougher and a four-cell cleaner. The final product now being produced, which is used entirely for making heavy-density mud for oil-well rotary drills, has a gravity of 4.35. Tables were originally installed in the plant, but are now out of service, it being found that separation at table-sand size was not economical between jigging and flotation sizes.

The flotation concentrate is pumped to a Dorr thickener. It is then filtered and passed through a rotary dryer, which reduces the moisture content to −1 percent. From the drying-plant hopper the finished product is dropped into specially built covered trucks, which carry it to Butterfield, where it is sacked and shipped. O. J. Benston is superintendent of the barite operation. J. A. Smith is assistant superintendent.

Magnet Cove Barium Corp. also produces barite in this area. The mine is an open pit, somewhat smaller than that already described, which joins the latter on the west. This company's mill is in Malvern. The company also employs flotation, but floats the barite, whereas the process used by National Lead depresses the barite.

After the stop at Malvern, I was privileged to inspect the bauxite mining and aluminum plants in central Arkansas. Unfortunately, in the interests of national security, little can be said about these important developments.

The Arkansas bauxites occur in an area known to include ten square miles (not all together) in Saline and Pulaski counties. These deposits were discovered in 1887 by John C. Branner, State Geologist, but no mining was done until 1899. Since that time approximately ten million long tons have been shipped, valued at about $60,000,000.

The bauxite is the product of weathering of Cretaceous syenite intrusives[5] and of marine sediments of Midway age, which were deposited on the lower parts of the eroded syenite surface. The weathering took place during an erosion period in Eocene time,[6] between the deposition of the Midway formation and the overlying Wilcox formation. Thus, part of the bauxite occurs interbedded with Tertiary sediments and part as a residual mantle on the higher parts of the undulate syenite surface. The bauxite deposits vary in depth from the surface to more than 500 ft. Most of the earlier mining was in open pits, but as these shallower deposits became exhausted more and more underground mining was done. In recent years more than half the production came from underground mining. However, the bulk of development brought on by wartime demands has been by open-pit methods. This is partly due to the improvement in recent years of earth-moving methods and partly to interest in lower grades of ore. Also, a large amount of churn-drill prospecting has been done in recent years, chiefly by the U. S. Bureau of Mines, and some new deposits have been discovered. Geophysical methods have also been employed with partial success in ore finding, the geophysical data serving to locate "highs" on the syenite surface.[7]

Mine operators now active in the district include: Republic Mining & Manufacturing Co. (affiliated with the Aluminum Co. of America), Reynolds Metals Co., American Cyanamid & Chemical Co., The Norton Co., Dixie Bauxite Co., W. J. Crouch Mining Co. (affiliated with General Abrasives Co.), Dulin Mining Co., and the Sweet Home Bauxite Co. Most of the producers sell their ore to the abrasives, refractory, and chemical industries, but most of the total production goes into the manufacture of aluminum. A part of the ore for the latter purpose is washed, dried, and shipped to the Aluminum Ore Co. Bayer process alumina plant at East St. Louis, Mo. The remainder is hauled by truck directly from the mines to a new Defense Plant Corp. Bayer process plant in central Arkansas, operated by the Aluminum Co. of America. Presumably, when the Reynolds Metals Co. gets into production, its output will go to the plant operated by the same company in northern Alabama.

[5] Mead, W. J.: "Occurrence and Origin of the Bauxite Deposits of Arkansas." *Econ. Geol.*, Vol. 10, pp. 28–54. 1915.

[6] Miller, R. B., and Herring, C. T.: "Bauxite and Aluminum." U. S. Bureau of Mines Minerals Yearbook, 1936, pp. 406–408.

[7] Stearn, Noel H.: "A Geomagnetic Survey of the Bauxite Region in Central Arkansas." Arkansas Geol. Survey Bull. 5, 1930.

Stripping bauxite in central Arkansas

Outline of Priority Procedures

for Mines, Smelters, and Suppliers

(Corrected to Dec. 5, 1942)

PRIORITY ASSISTANCE is granted for the purchase of mine maintenance, repair, and operating supplies under Preference Rating Order P-56. Under P-56 serial numbers are assigned to each mine entitled to apply the ratings granted by the order.

All domestic mines and smelters apply for serial numbers to the State mine coordinator (See *E.&M.J.*, June, p. 77). The State coordinator sends all applications to the Mining Division with his recommendation, which is taken into consideration at the time the applicant's case is considered. Serial numbers will be issued to mines and smelters which are considered essential to the war effort.

All foreign mines and non-ferrous smelters make application for serial numbers directly to the Mining Division, War Production Board, Washington, D. C.

Where reference is made to exercising preference ratings by endorsement, this is done by writing the endorsement quoted in *E.&M.J.*, August, p. 74, on purchase orders.

Domestic and Canadian Mines With Serial Numbers

Using less than $5,000 worth of materials listed in Priorities Regulation No. 11 per quarter for maintenance and repair, operate under Order P-56.

WITHIN QUARTERLY QUOTA assigned by the Mining Division can exercise AA-2X rating by endorsement (see *E.&M.J.*, Nov. p. 43) for repair quota items. This applies to repair parts for items on Schedule A of Order P-56 and to items listed in Priorities Regulation No. 11 (see Mining Division letter of Oct. 17, 1942). An A-1-a rating can be applied by endorsement for operating supplies.

Application for quarterly quota for the purchase of repair parts and materials must be made to the Mining Division on PD-400-A forms by metal mines, PD-400-B forms by coal mines and PD-400-C forms by non-metallic mines. Note that fabricated repair parts and equipment shown in Schedule A of Order P-56 should be shown in dollar value and material shown in Priorities Regulation No. 11 should be by weight.

In the case of breakdown, or imminent breakdown, or justifiable expansion involving all capital equipment, application must be made to the Mining Division, WPB, giving full particulars. In cases of great urgency a rating of AA-1 may be assigned by WPB. Revised PD-400-A forms are being mailed out for the first quarter of 1943 on which considerable additional information is required. This additional information will enable the Mining Division to discontinue the use of PD-119 monthly reports, now no longer required.

Domestic and Canadian Mines and Smelters

Using more than $5,000 worth per quarter of materials on metals control list under Priorities Regulation No. 11.

DOMESTIC AND CANADIAN MINES apply for quarterly needs of fabricated repair parts on the new revised PD-400-A forms and apply for materials on the metals list of Priorities Regulation No. 11 on form PD-25A. Domestic and Canadian non-ferrous smelters obtain their requirements for repair and maintenance under the Production Requirements Plan by submission of PD-25A form.

Domestic and Canadian Smelters

Using less than $5,000 worth per quarter of materials shown on the metals list of Priorities Regulation No. 11 operate under Order P-73 for maintenance and repair.

WILL BE ASSIGNED a dollar value quota for fabricated repair parts and a weight quota for unfabricated materials as listed in Priorities Regulation No. 11. These companies may endorse AA-2X rating for repair parts and materials within the limits of their dollar value and weight quota and may endorse A-1-a ratings for operating supplies.

For new equipment application must be made directly to the Mining Division, giving full particulars.

Domestic and Canadian Mines Without Serial Numbers

CAN MAKE ENDORSEMENTS of A-10 rating under Order P-100, as amended, for the purchase of maintenance, repair and operating supplies within the restrictions of the order.

Gold mines not holding serial numbers were closed by Order L-208 issued Oct. 8, 1942, with the exception of lode mines that produced less than 1,200 tons of commercial ore in 1941 and placer mines that treated less than 1,000 cubic yards of material in 1941, providing continued production shall not exceed 100 tons per month in either case. (The provisions of Limitation Order L-208, as amended Nov. 19, 1942, shall in no way prohibit the performance of the minimum assessment work required by the provisions of Section 2324 of the Revised Statutes of the United States and by Public No. 542, 77th Congress, 2d Session.)

In the case of cancellation of P-56 serial numbers held by gold mines, the effective date of Order L-208 will be 60 days from the date of cancellation.

South American Copper Producers Holding Serial Numbers Under P-58 and P-56

WITHIN SEMI-ANNUAL QUOTAS equivalent in dollar value to 125 percent of purchases for maintenance, repair, and operating supplies during the previous half year, can exercise AA-2X rating by endorsement for 35 percent of quota and A-1-a rating by endorsement for the remaining 65 percent on purchases for maintenance, repair, and operating supplies.

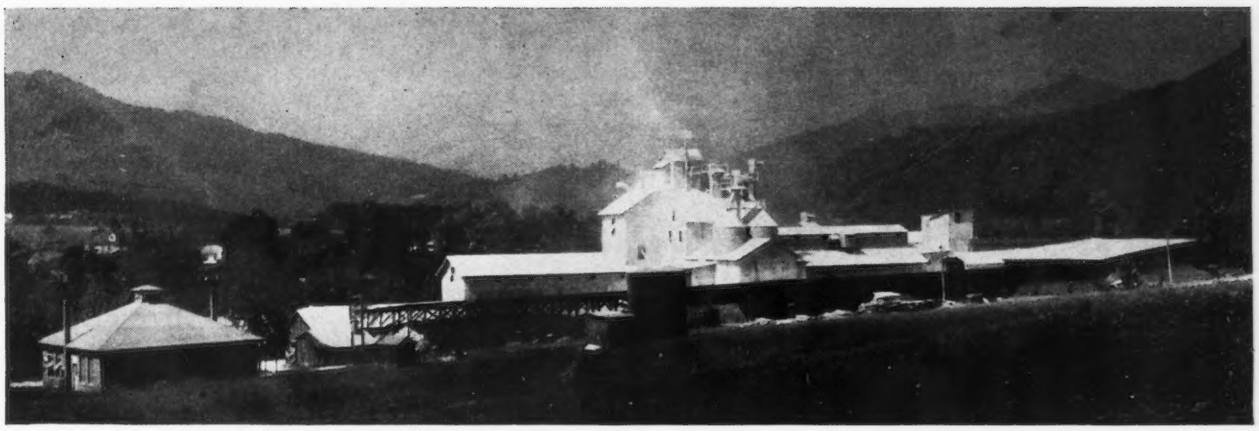
For breakdowns, imminent breakdown, justifiable expansion and all capital equipment application must be made directly to the Mining Division for a rating, giving full particulars. Monthly report of quota items delivered is required using form PD-119a for extensions made under P-56. Those companies operating under P-58 are required to submit monthly reports to the Mining Division.

Mining Machinery Manufacturers

OBTAIN THEIR REQUIREMENTS under the Production Requirements Plan by submitting quarterly PD-25A applications to the Mining Division. For their maintenance and repair they are authorized a dollar value quota through their PRP application. For emergency needs application is made directly to the Mining Division.

Controlled Materials Plan

PRIOR TO JAN. 1, 1943, all users of copper, steel and aluminum must apply for their second quarter needs for these metals under the Controlled Materials Plan (p. 45). Mines, smelters, and mining machinery manufacturers will apply to the Mining Division, which in turn will apply through Civilian Supply as the "claimant agency." Booklets covering CMP can be obtained from WPB.



Grinding plant of Consolidated Feldspar Corp. in northeastern Tennessee. The office is at the left

A Feldspar Grinding Plant in Tennessee

Its spar comes from the Spruce Pine area, in North Carolina—
A flexible flowsheet permits a wide variety of products

A. H. Hubbell
Associate Editor

FLEXIBILITY is an important requisite in the flowsheet of a plant that is engaged in grinding feldspar for the market. This quality is well exemplified in the flowsheet of the grinding plant of Consolidated Feldspar Corp. in Unicoi County, in northeastern Tennessee, which works largely, if not wholly, on feldspar mined in the Spruce Pine district in western North Carolina, grinding several thousand tons per month.

The Consolidated was organized in 1929, into it being merged several feldspar companies, including the Erwin Feldspar Co. (which had previously absorbed Golding Sons Co. and Clinchfield Products Co.); the Maine Feldspar Co., in Maine; the Dominion Feldspar Co.; New York Feldspar Co.; and Bedford Mining Co.—all three being in New York State. R. W. Lawson is president, M. J. McHugh, Jr., vice president and treasurer, and H. B. DuBois, sales manager, all with headquarters in Trenton, N. J. Ed Boone is general superintendent, with office at Spruce Pine, N. C.; E. W. Koenig is assistant general superintendent, with office at Erwin, Tennessee; and D. J. Grayson is superintendent of the grinding plant, in Tennessee.

The grinding plant, the operations of which are the subject of this article, is shown in an accompanying picture. Outside of it is stored its reserve stock of crude amounting to 8,000 to 10,000 tons, which is awaiting grinding. All of this has come from the Spruce Pine district. The various grades are separated by walls. The spar arrives in box cars. Four cars are unloaded at a time, one wheelbarrow-full being taken of each at a time in order to blend the four carloads, provided all come from the same mine.

Plant procedure under the flowsheet starts with the delivery of the feldspar in barrows to a chute that discharges on to a grizzly with 1-in. spacing between the bars. The oversize is crushed in a 15x30-in. Reliance crusher set to 1½ in., the crushed product being elevated to one of two 150-ton bins. The grizzly undersize is put over a 4-mesh screen, the plus-4-mesh material going to the same bin via the elevator and the minus size is sent to waste.

From the bin the product of the primary crushing is delivered by a Jeffrey feeder to the secondary crusher. A diaphragm valve on the latter controls the feeder. The crushed material is now dried in an open, vertical, baffle dryer, which is fired with coke.

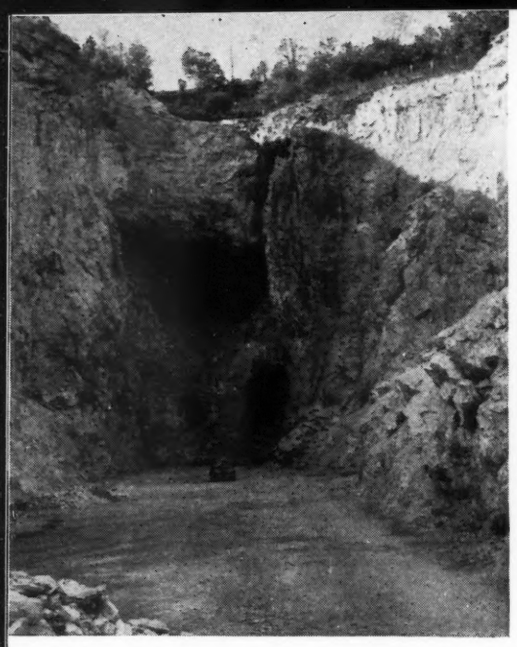
Crushing is done 16 hours per day, including both the primary and the secondary circuit.

The crushed, screened, and dried feldspar is next elevated to a double-deck Jeffrey screen. From this point on, the treatment depends on what the material is and what is to be done with It. It is impracticable to show the treatment given the dried material for each of the numerous final products. By way of continuing the general description, the procedure followed in making a semi-granular spar for the glass trade is to place a 4-mesh screen in the top deck of the Jeffrey and an 8-mesh screen in the bottom deck. The two oversizes are combined and crushed in one of two Symons Short Head crushers working in closed circuit with a 20-mesh screen. Eight-mesh undersize from the double-deck Jeffrey is put over one or both of two single-deck Jeffreys equipped each with a 20-mesh screen. The plus-20-mesh size from these is also sent to the Short Head. The minus-20-mesh spar from the single decks is combined with the minus-20-mesh undersize of the screen working in closed circuit with the Short Head and sent to the magnetic separators.

The 4-8-20 split just described is used, according to the staff, to save screen cloth and to get a better distribution of sizes through the Symons crusher. At times a −8+20 material is taken out of the circuit and used as tube-mill feed.

Magnetic separation is done on a battery of eight Exolon separators. The cleaned spar goes to storage after being put over a scalper screen, which is used as a check screen to insure against oversize material in the finished product. The Exolon separators are so set that half of them can be used for 8-mesh material and half for semi-granular. Semi-granular spar is minus 20 mesh with 15 to 25 percent through 200 mesh. There are thirty 70-ton storage bins.

When granular spar (100 percent



McKinney mine, on Crabtree Creek, in the Spruce Pine area. Operated by the Consolidated, it is said to be the largest feldspar mine in the East. The automobile on the bottom provides a scale

minus 20 mesh, 1 to 5 percent through 200 mesh) is being made, a minus 20 mesh is taken after leaving the Jeffrey screen and put through a Tyler 400 screen having 50-mesh wire. Oversize follows the same circuit as the semi-granular. The undersize, which cannot be thrown away, goes to the 8-mesh circuit because an 8-mesh material must be mixed with it so that it can be fed to the tube mill without squirting. Such very fine material would squirt like water.

Products made thus far have been: (1) Granular, all minus 20, 1 to 5 percent through 200. (2) Semi-granular, all minus 20, 15 to 25 percent through 200. (3) 8-mesh, simple for the Hardinge mills.

At this stage everything is in bins and sampled. Of the 30 bins, eight on one side hold granular and semi-granular. This is fed from the bins by homemade belt feeders and weight regulators. These feeders ride rails under the bins and can be moved to any bin. The feeder belt delivers to a closed conveyor which discharges to a covered hopper car or a box car.

A certain amount of granular and semi-granular spar has to be bagged. To permit this the feeder is turned 90 deg. so as to deliver on to a belt conveyor running under the bins and parallel with their length to the bagging chutes. Bagging machines are not used, because they do not work well on the coarser mesh sizes. Where bagging is practiced, it is done 100 lb. exactly to the bag. Customers using these bags in batch work are very particular about the weight per bag being exact.

The other 22 bins of the 30 hold material for fine grinding by the Hardinge mills, three of which are on the floor. From these bins the materials needed for making any desired mixture are drawn volumetrically into 5-cu.ft. hoppers. This mixture is delivered to the head bin over the Hardinge mill, which is 8x72 in. size. The mill discharges to a Hum-mer screen with 40-mesh cloth. The plus-40-mesh material is returned to the mill and the undersize goes to a 14-ft. Sturtevant air separator, which makes a finished minus-200-mesh product and an oversize reject, which is sent back to the Hardinge mill. For making potter's flint the grind must be 99 percent minus-200 mesh.

All glass spar of 20-C, 20-F, and 40-mesh grades is ground in an 8x48 Hardinge mill and screened on a Tyler Hum-mer in closed circuit with the latter, using screen cloth of the mesh necessary to give the desired size of product.

On the floor below, grinding is done for anything 120 mesh and finer. This is accomplished in two 8 ft. by 30 in. Hardinge mills in tandem working in closed circuit with a 40-mesh screen. The minus-40-mesh product goes to a 14-ft. Gayco separator, which makes a finished product and a reject that is put through another 14-ft. separator also making a finished product. The reject of the second separator is finished in a 5x22-ft. tube mill and returned to the first Gayco. Finished fines from both Gaycos are sampled and elevated to a car for shipment, or to a bagging chute, or to the finished-material bins of 300 tons' capacity each, of which there are six.

All mills are lined with silex and use flint pebbles. Of the latter there is a stock on hand.

As has been seen, the flowsheet of this grinding plant is very flexible. There are many spouts, elevators, chutes, and conveyors, and by these means any of the grinding mills can be used for any purpose.

Capacity depends on the fineness of the product made. If this is something that is minus-120 mesh and finer, 4 to 5 tons per hour can be made. This would be done with the three mills on the bottom floor comprising two Hardinge mills and one tube mill.

The fine products made are many. They are listed in the accompanying tabulation. In addition to the fine products cited, based on mesh alone, some 50 to 60 chemical grades are made, each having a certain chemical analysis, as well as specified mesh.

The plant has two installations of Northern Blower bag-type dust collectors, one in the fine-grinding section and one in crushing department. The men are required to wear respirators.

The plant has a well-equipped machine shop. Considerable equipment such as feeders, screw conveyors, etc., is made on the premises. In the same building as the office is the laboratory. In the analytical room is done the bulk of the analysis for all plants of the company except that for Keystone and Kingman (which is done at Keystone). About 200 samples are run per month for complete analysis, including SiO_2, Al_2O_3, Fe_2O_3, CaO, Na_2O, K_2O, and occasionally P (as P_2O_5) and TiO_2.

The total force in plant and office is approximately 50 men.

Five Products Made at Consolidated Plant

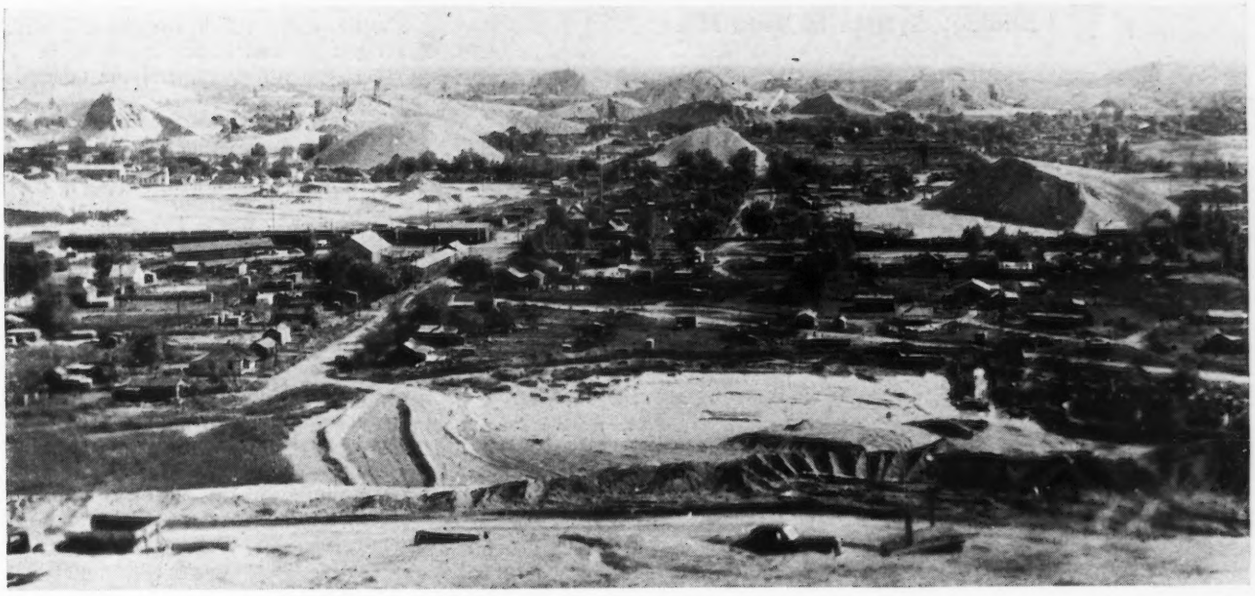
20C glass spar	100%— 20 mesh,	40%—200 mesh
20F glass spar	100%— 20 mesh,	55%—200 mesh
40-mesh spar for glass and enamel	100%— 40 mesh,	60%—200 mesh
120-mesh spar for enamel	100%—120 mesh,	90%—200 mesh
120 to 140 mesh spar for enamel	100%—120 mesh,	95%—200 mesh
200-mesh spar for pottery, tile, insulation		99.7%—200 mesh
230-mesh spar for pottery, tile, insulation		99.3%—230 mesh

Limits—Iron in glass spar	0.06%
Limits—Iron in pottery spar	0.08%
Limits—Iron in enamel spar	0.08%

R. W. Lawson, president of Consolidated Feldspar Corp., Trenton, N. J., at left, with members of the staff of the Tennessee grinding plant; E. W. Koenig, general superintendent; M. J. McHugh, Jr., executive vice president; Paul Willis, purchasing agent and office manager; Harold Hendrix, chemist; Tom C. Carson, chief chemist

D. J. Grayson, superintendent of the Tennessee plant

Edward Boone, general superintendent for the company, with office at Spruce Pine



View of Picher, Oklahoma, and surrounding chat piles

Tri-State District Strives to Maintain Output

Great zinc-lead camp needs higher prices or premiums to offset depletion

Evan Just
Assistant Editor

THE famous Tri-State zinc-lead mining district (formerly known as the Joplin district), the great productivity of which has made its name almost synonymous with zinc for two generations, is now finding difficulty in maintaining its dominant position in the nation's roster of zinc-producing areas. The massive, flat-lying orebodies at shallow depths which contributed so heavily to the country's first World War effort and, during the twenties, poured out two-thirds of the national zinc output, have by now been sufficiently depleted to require valiant efforts to sustain the 40 percent of the total which has been the district's contribution in recent years. Despite such efforts, made with the benefit of a considerable increase in prices, or price equivalents, the district is scarcely holding its own.

The premium price plan, whereby Metals Reserve Co. pays premiums to producers for over-quota production, amounting to $29.70 per ton of zinc concentrates and $41.80 per ton of lead concentrates, has been of considerable help in facilitating production and thus preventing a more serious decline. However, premiums have not been sufficiently large to beget an actual increase of production, notwithstanding the fact that the joint WPB-OPA quota committee has gradually lowered quotas until nearly all the district's output enjoys full premium payments.

Under the stimulus of wartime needs and premium prices, a large number of new operations have sprung up, most of which are comparatively small. There are now 33 mine-mill operators, many of whom have several mines and mills. The largest, Eagle-Picher, has about 35 active mines, and concentrates approximately half the district's production in its Central mill, which has a capacity of 14,000 tons per day. There are 13 large tailings re-treatment operators, three of whom have two mills. In addition, there are 15 small mill and 65 small-mine operators. Most of the latter ship ore to central mills.

This activity has brought out a considerable increase in the amount of ore mined, but the average of mined ore has dropped to a 5 percent yield of total zinc and lead concentrates. A number of old properties have been reopened and some new ground is being developed, particularly in a low-grade area west of Baxter Springs, Kan. There has also been a considerable revival of production in the older sections of the district near Joplin and Waco, Mo., and Galena, Kan. A considerable part of the old field near Joplin is still under water.

Several of the new operations have been made possible through loans granted by the Reconstruction Finance Corporation. Also, the Eagle-Picher company, acting as agent for Metals Reserve, is reopening the Paxson mine and mill, west of Baxter Springs.

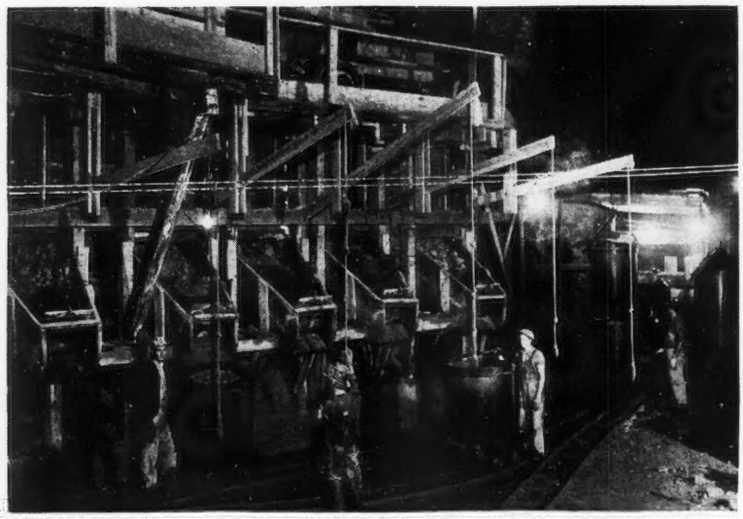
A year ago several mines were operating double-shift. In the intervening time this practice has been pretty much abandoned, chiefly because competitive employment opportunities are sufficient in the region to make it impossible to gather together efficient crews for night work. Although it can scarcely be said that lack of labor has seriously curtailed production up to the present time, there is now a moderate shortage of labor, particularly of efficient labor. This situation has been aggravated by government activities in aiding outside employers to recruit labor in the area.

Largely because of anticipated shortages of efficient labor, there has been a notable increase in mechanical loading. The use of scraper-loaders, particularly with portable ramps, was already well established in the district and has been increased. Also, a large number of mechanical muckers of the Eimco, Sullivan, and Gardner-Denver types have been put into service, with marked success. In some mines these units are used exclusively.

One mine, the Eagle-Picher Blue Goose No. 2, in the southern part of the Picher field, has been mechanized by an unusual departure from common Tri-State practice. Instead of the typical "cans," hoisted on a free-swinging line by an elevated hoist, skips are used. Underground, the skip pockets are fed by rubber-tired

Haulage System in Netta Mine

Caterpillar-mounted scraper-loader filling storage-battery-driven hopper-bottom truck, which hauls ore to underground hopper shown below. Note use of pneumatic tires, a feature finding wide acceptance



Truck shown in above photograph discharging into underground hopper from which "cans" are loaded. This installation serves in lieu of a skip pocket, so that "cans" can be used in hoisting

Mechanical shovels loading "cans" in Rialto No. 3 mine, a property where hand-loading has been discarded entirely. Similar technical advances are under way throughout the district

shuttle cars, which are loaded with scraper-loaders. This mine is in a "sheet-ground" area, and the methods used have resulted in an unusually low mining cost.

Another interesting departure from standard Tri-State practice is at the Eagle-Picher company's Netta mine, at Picher, where storage-battery-driven trucks are used in conjunction with scraper-loaders. Because the shaft and derrick are designed for hoisting "cans," these trucks are driven up an incline and dump into an underground hopper, from which ore is loaded into "cans," for hoisting.

There is abundant evidence that the Tri-State shares the tolerance toward new ideas that is characteristic of most mining operators everywhere and which has resulted in the mining industry making such great strides in the improvement of its technique and methods. Experiments of various kinds are constantly going on in the district, testing mechanical devices or management methods, with a view to increasing output or lowering costs.

Prospecting with churn drills is fairly active, although there is only roughly one-fifth the number of drills running that prevailed in the twenties —namely, about 60. This is partly due to a dearth of likely places to prospect for ore that can be mined at present prices and partly because the intelligent application of geology has enabled a few drills to do the same job which formerly required many.

A sizable contribution to the district's production for many years has been by tailings re-treatment mills, many of which are of considerable size, handling in excess of 100 tons per hour. These operations run 24 hours per day seven days a week. Because the supply of tailings easily susceptible to re-treatment was pretty well used up by mid-1942, the principal tailings operations have had to resort to tailings which have already been milled twice and average about 1.25 percent sphalerite content. An efficient operation rerunning tailings of this quality can extract a concentrate yield of approximately 0.4 percent. Such operations were facilitated by the granting of full premium payments to all tailings production, but even with this benefit profits are small.

It is commonly conceded that another two years of depletion at the present rate will bring most Tri-State mines to the abandonment stage and that the district's output will suffer accordingly. Unless a drastic increase in concentrate prices or premiums occurs, probably this prediction will not be far from the truth; however, a large increase in prices or premiums, if given in time, could materially change this outlook for the better, by stimulating prospecting and the development of low-grade ores not now minable.

MINE, SHOP, AND PLANT

Trouble Shooting With Control Equipment

TROUBLES are bound to occur in the best of control equipment. Knowing what to do about them when they do occur will save much precious time. E. H. Alexander, who last month dealt with the selection of such equipment, discusses in the following some of the more common types of trouble which the maintenance force encounters with control devices. He says that if the fundamental cause of each trouble is understood, the remedy will probably be apparent, and ways will be found to lessen the resultant difficulty. The first item he considers is contactors:

A contactor has several bolted or spring-closed contacts. Excessively high resistance at these contacts is the cause of the very high temperatures, such as 100 to 200 deg. C., that may be reached when the contactor is carrying rated current or less. The most likely point of high resistance is at the contact where the movable tip makes contact with the stationary tips.

However, high resistance may occur at any of the several bolted joints on the contactor. Therefore, if one of these devices begins to develop an excessive temperature, a millivoltmeter should be used to show which of the joints has a high-voltage drop across it. There is an a.-c. millivoltmeter that can be used for a.-c. contactors.

When the contact (or contacts) has been located, correction can be made by opening it and removing the oxide with a file (not with sandpaper or carborundum paper). It is unusual to find a high resistance in a bolted joint unless the contactor has previously reached excessive temperatures. However, when excessive resistances are found in joints the cause should be removed.

As high resistance will most commonly be found in the active contact, it is a simple matter to inspect these tips weekly or monthly. If the temperature is unduly high, the tips should be given a few strokes with a file.

These comments apply particularly to copper contacts because they oxidize readily and the oxide formed has a high resistance. A file will remove it and reduce the resistance again. Depending on conditions, it may take a short or long time for the formation of sufficient oxide to cause excessive heating in ordinary service.

However, if sulphur gas is present, a high-resistance film will develop rapidly. To prevent this, the contactor should be mounted in a tightly gasketed inclosing case, or immersed in oil.

Sometimes it is not practicable to keep the resistance of contacts low by filing them. When it is desired to maintain a low resistance of the active contact without servicing, a silver face can be brazed to the two tips so that the contact is made through that metal. Silver oxide has a higher resistance than the pure metal, but when heated it has the unusual property of reverting to the metallic form. Therefore, silver contacts are self-purifying.

Electrical interlocks may fail to make circuit because of oxidation where copper contacts are used. Sometimes such failure occurs because dirt gets between the contacts. By using one hemispherical and one flat tip made of silver, both troubles will be overcome.

Excessive wear on the contact tips of a contactor indicates that it is operated frequently. For such conditions silver should not be used for the contacts. It will not stand up as well as copper.

If the service is heavy, and if the root-mean-square of the current is not more than equivalent to three-fourths of the contactor's rating, the tip can be faced with an alloy that will last several times longer than copper tips. The cost of this material is high, but its use is sometimes warranted.

Some maintenance men have the erroneous impression that contact tips that have been roughened by service should be kept smoothed up so that they will carry the load. A roughened tip will carry current just as well as a smooth tip. Of course, if a large projection should appear on a tip because of unusual arcing, it should be removed.

A large percentage of contactor coil troubles can be traced to heating. If the temperature can be reduced coil troubles can be greatly decreased. As the heating of a d.-c. coil will vary as the square of the voltage, and the heating of an a.-c. coil will vary approximately as the cube of the voltage, it follows that coils should be wound for the voltage that exists on the line. If the ambient temperature is high, this precaution is all the more important.

When Coils Burn Out

When an a.-c. magnet, such as a solenoid, is supplied with constant-voltage excitation, it requires a large inrush of current to close the armature. When the armature closes, the coil current drops to a normal value.

Replacing a movable contact on a 2,300-v. motor control. Renewal parts should be kept handy at all times

Sometimes it may not close because of excess friction or for other reason and the large inrush current may burn out the coil within a few seconds.

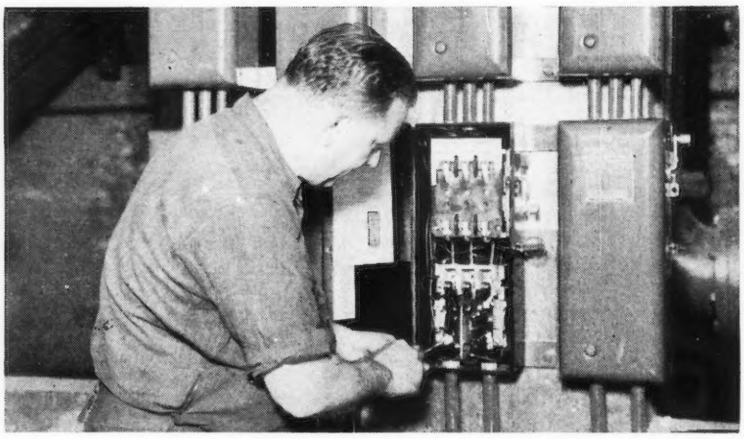
Such mishaps can be prevented by using a thermal cutout to protect the coils. When the cutout opens because the armature fails to close, it is merely necessary to replace a small link made of two pieces of metal held together by a low-melting-point solder.

Resistors are important auxiliaries and come in many types, some of which are more likely to develop certain kinds of trouble than others.

Cast grids are usually assembled and held together by being clamped on a tie rod. The current passes from one grid unit to another across a ground face. When too much current, say several hundred amperes, is made to flow across these ground surfaces, they may develop high resistance and destroy the joint.

To overcome this difficulty, these joints should be cleaned and the current path paralleled. This will reduce the current in the middle joints, where the trouble usually occurs or is most likely to develop.

Edge-wound or strip resistors usually have their terminals either brazed or welded to the strip, which prevents excess resistance from developing at this joint. To provide an adjustable contact on such a resistor, a clamp-type terminal is sometimes



The surrounding atmosphere determines to a great extent the proper type of inclosure to be used

furnished. However, as the resistor may get hot at this point, a bad contact is likely to develop. In such case, the best cure is to braze the terminal at the proper position.

High-resistance cast grids of small cross-sectional area sometimes give trouble because of breaking, especially if mounted on machines that vibrate severely. The best correction is to use an edge-wound unbreakable resistor. This type is made of corrosion-resisting material that can withstand high temperatures without scaling.

Relays

The function and importance of relays is too well known to need discussion. To cover all relays used would be an endless task. A number have been designed to operate as a function of time. The one first designed to operate on a time basis was the dashpot type. Movement of a solenoid is retarded by a dashpot, giving a time-current relation that is called an inverse-time characteristic.

The kind of trouble that is inherent in a dashpot was the primary reason for the development of the other types of timing relays. A dashpot is essentially a close-fitting device, easily affected by dirt, gumming of the oil, and corrosion of the parts. Also the torque of the magnets varies with the position of the solenoid armature in its coil.

If trouble is had due to tripping while starting a motor or shortly after getting up to speed, there are three things that can be done:

1. A heavier oil may be used if the relay almost holds.

2. A starting contactor can be used that does not include the overload relay in the circuit. After the motor is up to speed, the running contactor can close and the starting contactor can open, connecting the overload relay into the circuit. This is rather complicated, but it is sometimes used.

3. The final alternative is to replace the dashpot with a temperature type of overload relay. This is one of the reasons why the temperature-type overload relays were originally developed.

Because the function of a temperature overload relay is to protect a motor under all ambient temperatures, its final temperature should be the same as that of the motor, or 90 deg. C. This means that a motor can have a 50 deg. C. rise in a 40 deg. C. ambient.

Therefore, the relay should just trip if placed in a 90 deg. C. ambient or in a pail of water held at that temperature. If a relay does not function correctly, it should be immersed in water kept at 90 deg. C. and adjusted so that it will. The adjustment should not be made by bending the thermoflex strip. If this method of checking or adjustment does not provide the necessary degree of protection to the motor, it can be assumed that the size of relay heater is not correct.

A temperature overload relay does not need the attention outlined for dashpots, but its use does involve the observation of certain precautions. For the reason that it is sensitive to temperature, it should not be put in a strong draft, as from a window or a circulating fan. If necessary to place it in such a position, it should be shielded by a cover.

Conversely, a temperature overload relay should not be located above a source of heat, such as steam pipes. In brief, it should be in an ambient temperature that does not differ greatly from that of the motor.

The third type of relay is used for controlling the rate of acceleration of motors and for other functions where a short-time-delay is needed. In the escapement type, a pendulum is used as the governing means, which makes mounting necessary in a definite position with respect to the pendulum's motion. It is not always possible, however, to mount the relay in the proper position, and when this is so, it is less dependable. Shortening the pendulum makes it possible to tip the relay further from the vertical, but the shorter pendulum results in a shorter time delay. To overcome this limitation there is a new design that has a balanced pendulum. The variation in time is obtained by changing the length of stroke.

If the old-type escapements fail to time properly, their mounting position should be checked. However, if the application is such that it is difficult to mount and keep the relay in proper position, use of the balanced type should be considered.

Corrosive fumes in many plants rapidly attack the metal parts of control devices and render them inoperative. To overcome this trouble all the operating parts are frequently immersed in oil in a container capable of withstanding the corrosive atmosphere.

Know the Equipment

Control equipment can be quite simple or very complex, and the job of the maintenance man is easier if he has available instruction books and wiring diagrams covering every piece of control and every circuit. Extra coils and contact tips should be kept on hand as well as a complete list of spare parts. The work is simplified if the maintenance man makes a practice of becoming familiar with the circuits and operation of each new controller as it is installed.

Keep Them Rolling

ANTI-FRICTION BEARINGS are unending cause for wonder, when the low-maintenance and lubrication costs they give are noted. But even they need lubricant, and the proper kind and grade. According to a well-known bearing maker, the lubricant must lubricate (1) the sliding contact between retainer and other parts; (2) any contact between races and rolling elements which is not true rolling; (3) the sliding contact between rollers and guiding elements, in roller bearings. It must also protect the highly finished surfaces from corrosion and help seal housings against foreign matter. Both oils and greases are used. Note that all grease in a bearing must be removed at intervals and replaced with fresh lubricant.

Take Another Look

GET RID OF DORMANT SCRAP. In every plant there is still some of it around. Dormant scrap is officially defined as obsolete machinery, tools, equipment, dies, jigs, etc., which are incapable of current or future use because they are broken, worn out, unrepairable, dismantled, or in need of parts. Such scrap will often stare one in the face yet escape attention. So take another look.

Profits from Welding

WELDING saves critical materials, cuts production costs, as more than one mining company which makes its own cars and other equipment has found. Results of the recent 2½-year study sponsored by the Lincoln Arc Welding Foundation are added evidence. One award was for substitution of an all-welded design of crawler-excavator and crane in place of a cast-and-riveted unit. The resulting machine was stronger, 8 percent lighter, 13 percent cheaper, and required less time to make. Boom weight was also less, reducing the amount of counterweight.

Another winner was the design for a scraper-loader, by a company that had been making drags for 20 years. Point of interest was the welding of the deck plates (up which the load is dragged), avoiding grief from worn bolt holes and rusted threads. It was assumed that users could make necessary repairs by welding. Still another award was for an arc-welded narrow-gage car. Deflection under load was less, durability was greater. Assembly was so accurate as to make machine work unnecessary.

On the Care of Drill Steel

CAREFUL SELECTION, forging, and tempering of drill steel, including detachable bits, are prerequisites to efficient underground drilling operations. Poor drill steels directly increase the work of the drill-sharpening shop and also increase mining costs. A minimum number of drills will be required by the mine for normal work when each drill is properly shanked and bits are made to gage and properly hardened. Uniform drill steel of a definite carbon content is an essential basic factor. Poor steel or steel varying between wide carbon limits results in lack of control in the sharpening operations, and trouble in general. The difficulty can be overcome by careful selection and purchase of steel. Undersized steel for the work on hand may be the cause of excessive steel breakage, which generally can be remedied by selection of a more suitable cross-section. In addition, it is most important that drills are not subjected to work beyond specified operating conditions.

Probably one of the most prolific causes of rock-drill breakage is poor blacksmithing in the drill-sharpening shop. Satisfactory results can be obtained only by maintenance of suitable standards. Assuming that a suitable cross-section has been chosen, the general mine requirements are straight steel, bits of standard size and uniform hardness, and shanks properly hardened and conforming exactly to the manufacturer's size standards. When treating hollow steel the hole must be clean and uniform in diameter throughout the entire length of the drill and properly finished at the bit and shank ends. The best results can be obtained by doing the work in modern machine sharpeners operated by men held to a definite standard. Periodic inspection of the dies and swage blocks and replacement of those exceeding the limits of wear are essential to turning out uniform and true double-taper cross bits.

Bits and shanks must be forged and tempered at specified temperatures, and heating in the furnace should take place in a reducing atmosphere. Employment of efficient control devices is of utmost importance. Properly designed heating equipment and quenching tanks, and standardization of sizes and procedure and maintenance of the set standards will result in uniform drills, giving all of the service that can be expected from steel of the carbon content used. Poor drill-sharpening equipment will prevent attainment of maximum blacksmithing efficiency and may greatly handicap the blacksmith in turning out a satisfactory product. Rushing the blacksmith should be avoided at all times, for it causes poor work. It is good policy to employ an adequate number of blacksmiths and to give them tools in good condition. A good shop arrangement will conserve time. By maintaining a high standard the minimum number of drills will be returned to the shop and the units handled will be reduced so that more time can be given to the work on a single steel. Thus after such a system has been put into effect the blacksmiths readily attain the standard set without excessive labor input.

Getting Along With Obsolete Machinery IV

OUR 5-ton dinky had been in continuous service for twenty years before receiving major repairs (writes Jay B. Hess). In the winter of '39-'40 its water system froze up and cracked the casing for nearly three quarters of its circumference. Upon my arrival I noticed that the brazing job had been so poorly done that it could not hold together for much more than another month. There was no record of any outside shop work having been done on this machine and its fuel and oil consumption was decidedly extravagant.

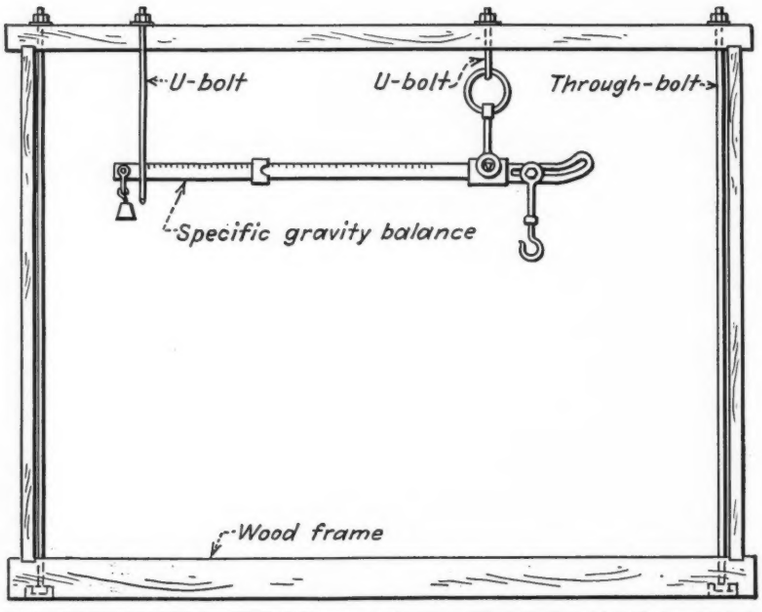
Arrangements were made with an expert welder and a local machine shop which had done reboring jobs for two other owners of locomotives of the same make as ours. In talking with the owner of this shop, I suggested to him that because our Buda engine must have been obsolete for a long time, it might be well for him to verify the fact that he could get the correct size of pistons before setting his exact time for completing this job. He assured me that he had never met with any delay on that account and promised to return the cylinder block and pistons five days hence. So we planned accordingly and he sent a telegram at once for the pistons. Next day he learned that the makers had disposed of all such obsolete items to a junk dealer the year before. He had to postpone the boring job until a special messenger succeeded in finding pistons which could be used, with the result that his delivery to us was twelve days overdue.

Taking that experience as both a warning and a command, I immediately set about investigating the stock of spare parts now available for every one of our heavy-duty machines, referring to them of course by correct serial numbers. From that campaign I learned that we could no longer get liners for our swing-hammer mills from their maker. The next step was to get a list of names and addresses from that manufacturer of a score of customers who had been buying supplies for the same model that we were using. Then, by circularizing those former users, we managed to locate two concerns which still held valuable stocks of those liners and numerous other items for which there was no longer any need, as they had replaced the obsolete machines.

When our dinky finally got back to work, it consistently hauled 60 percent more tonnage, per gallon of gas, than had been recorded for years and oil consumption was normal.

The locomotive being a chain-driven device, we had to maintain several 1-ft. lengths of chain on hand, as well as a supply of separate links so that we could take out the slack from time to time. Because we once postponed that kind of attention a day too long, our dinky suffered the worst accident known for twenty years in this district, where three similar engines have been elsewhere employed. In backing out of the quarry with a loaded train of 25 tons of rock, the driver nearest to the sprocket encountered a stone between the rails—accidentally rolled there by a *rabbit hunter* who had passed, unseen, after the dinky went into the quarry. Due to the momentary shock, after which the stone ceased to constitute an obstacle, the momentum of the drive chain threw a link, over the one already engaged upon the sprocket, thereby developing a powerful wedging action between the cast-iron crankcase and the steel sprocket wheel. If the stone had only stopped all further movement of the engine, the damage might have been less. As it was, the rear axle, with both journals and most of the reduction gears, had to be replaced.

USEFUL OPERATING IDEAS



Frame for Gravity Balance

AN APPARATUS used frequently for testing pulp at the mill is the specific-gravity balance. Whenever a test is to be made, the balance must first be carried to the designated mill department and then rigged up for the actual test. Considerable time usually is lost when carrying out the latter operation. Realizing the shortcomings of this procedure, the staff at the mill of Golconda Syndicate, Golconda, Nev., evolved the simple balance layout shown in the accompanying sketch. Its outstanding features are (1) portability, and (2) instant readiness for service at the point of use. As will be seen, the arrangement consists simply of a wooden frame held together by two steel through-bolts. The balance proper is attached to the top piece of the frame by a short U-bolt, and a second and longer U-bolt acts as a stop and guide for the leg of the balance.

The complete unit is light in weight, and hence can be carried easily from place to place.

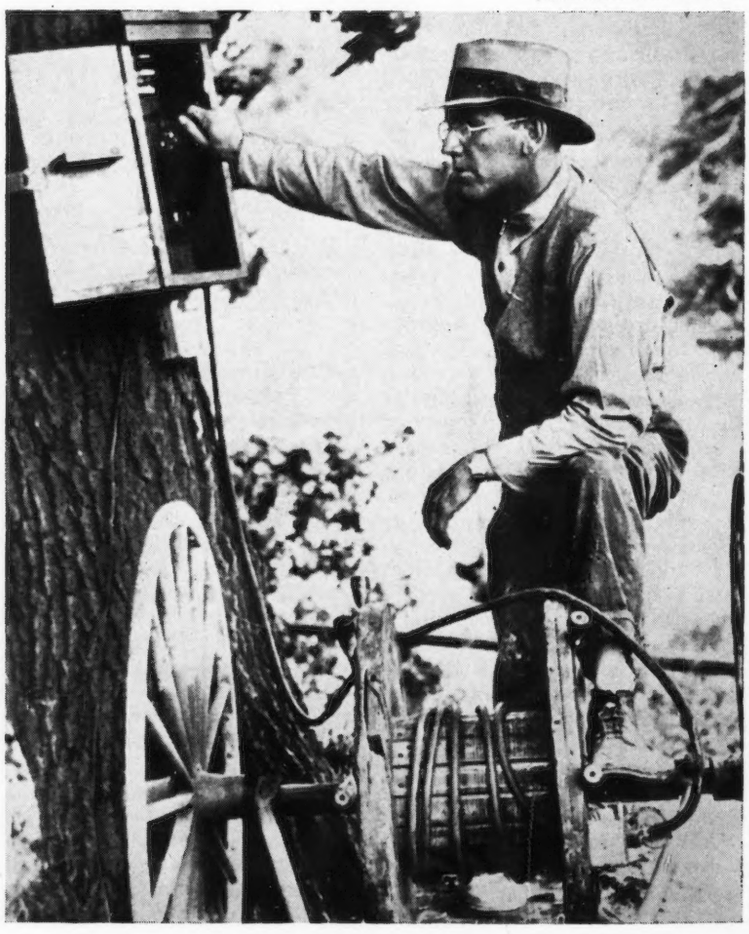
Cable Reel For Blasting

THE BLASTING CABLE reel illustrated holds 800 ft. of Super-service cord composed of two stranded No. 12-gage wires twisted over each other to provide greater flexibility, and these in turn are laid in a heavy coating of live rubber to resist the abrasion on pit or quarry floor, according to P. C. Ziemke, Milwaukee, Wis.

The reel is made from a discarded wire reel and is mounted on a section of 2-in. pipe, which serves as a bearing for the axle. This pipe rests in the ends of the two shafts fashioned by the quarry blacksmith from 1-in. pipe. The reel end of the cable is fastened to a heavy-duty receptacle by way of a hole drilled in the side of the reel. This arrangement permits paying out only the length of cable required to reach the shot with a safety margin in mind for the head blaster. The distance from receptacle to switch is spanned by a 10-ft. length of cable kept only in the possession of the blaster along with the key to the switch box. The axle and wheels were salvaged from a junk pile.

This mobile unit makes shots possible from almost any point along the pit or quarry in limited time. Weekly check-up for insulation failure with a Megger reveals any defects in the line. The switch is a 65-amp., double-pole, double-throw unit mounted on a slate base in a stout wooden box. The baffle on the door prevents locking the switch in the firing or "up" position and the lower switch clips are strapped together and to a permanent ground connection to short circuit any "sneak" or ground currents present. Thus, while the switch is locked and the firing line is plugged in, the blaster can use the line to test for ground leaks in the connected maze of detonators.

Milwaukee Journal Photo



PERSONAL ITEMS

Ernest Crawford Carson, Conservative member of the Legislature, has been appointed Minister of Mines and Trade and Industry in the British Columbia Government. Mr. Carson is 48 years

ERNEST CRAWFORD CARSON

old, and was born in the Lillooet district which he represents. He has been in public life since 1928, when he first won the Lillooet seat for his party, and is well and favorably known.

R. S. Kroger, geologist, is supervising drilling operations at Wakefield iron mine, Wakefield, Mich.

Robert B. Moran, geologist and mining engineer, announces removal of his office to 437 South Hill St., Los Angeles, Calif.

Russel Cornell, mining engineer of the staff of St. Joseph Lead Co., is at the Aguilar lead-zinc mine, in Argentina.

Andrew Leith, geologist, son of Dr. C. K. Leith, has been appointed deputy chief of the ferro-alloy branch of WPB.

Stanly Easton, president of Bunker Hill & Sullivan Mining & Concentrating Co., was in New York and Washington on business early in November.

P. J. Mulcahy has been appointed Chief Gold Commissioner for British Columbia in addition to Gold Commissioner for the Victoria mining division.

A. E. Mosier, president of Lucky Tiger-Combination Gold Mining Co., resigned on Oct. 1, and was succeeded by **Dr. George B. Norberg.** Mr. Mosier is 85.

John Platts, well-known geologist of the Coeur d' Alene district, is directing development operations at the Tri-Metals property at Phillipsburg, Mont.

R. L. Brainard, of Kellogg, Idaho, president of Metropolitan Mines Corp. and director of Sunshine Consolidated, *E.&M.J.* Idaho Correspondent, has been elected to the Idaho State Senate.

Walter R. Vidler has resigned his position with the American Mining & Research Corp. of Upper Darby, Pa., and after a few weeks in Washington, D. C., will make headquarters in Denver, Colo.

R. M. Sermon, who recently returned from Panama, where he had been in the federal service, is now on the staff of Oliver Iron Mining Co. on the Gogebic range.

Charles A. Neal, James K. Richardson, and **John A. Robinson,** all of Miami, Okla., have been selected to represent the Oklahoma district on the board of governors of the Western division of the American Mining Congress.

Arthur Campbell, Idaho State Mine Inspector, has been re-elected for his fifth consecutive term of two years. Prior to assuming the office of inspector Mr. Campbell was a miner in the Coeur d'Alenes.

R. S. Handy, for 30 years general superintendent of the Bunker Hill & Sullivan mills at Kellogg, Idaho, has resigned and will engage in private consultation work. He has charge of several mill building operations in central Idaho and Nevada.

Fritz J. Hansgirg, who developed the process for the production of magnesium carrying his name and used by Permanente Metals Corp. on the West Coast, has been released from internment and is now teaching chemistry in a college at Black Mountain, **N. C.**

Maurice W. Summerhayes, who since 1929 has been responsible for the management of the Wright-Hargreaves property at Kirkland Lake, northern Ontario, resigned as general manager on Dec. 1. He will continue as managing director, however. **R. L. Heely,** who has been superintendent for some time, succeeds Mr. Summerhayes as general manager.

Col. D. C. Jackling, of San Francisco, managing director of mining operations for Kennecott Copper Corp. and president of Utah Copper Co., retired from both posts on Oct. 1. **D. D. Moffat** succeeds him as president of Utah Copper and has also been elected a vice president of Kennecott.

G. H. Wilson, former mine superintendent of Bralorne Mines, Ltd., is now in charge of Bralorne's cinnabar property in the Omineca district; **R. Jackson,** formerly assistant master mechanic at Bralorne, is master mechanic at the new project.

W. A. Knoll, general superintendent of Pickands, Mather & Co.'s properties on the Gogebic range, has announced the appointment of **L. E. Joppa** as superintendent of the Plymouth mine, on this range, to succeed **Kenneth Duncan.** Mr. Joppa has been employed recently as chief engineer in the company's office in Hibbing.

Guy C. Riddell has been appointed chief of the Mining Projects Branch, Export Office of the Board of Economic Warfare, with headquarters in Washington. It is the function of Mr. Riddell's branch to maintain the flow of matérial and equipment for foreign mining and metallurgical operations that are vital to the war economy of the United Nations.

George E. Zeigler, for the past two years with the U. S. Bureau of Reclamation at Redding, Calif., has been transferred to the Reconstruction Finance Corp. at Los Angeles, in the capacity of engineer examiner on strategic mineral deposits. Mr. Zeigler may be addressed at 2328 Carlye Place, Los Angeles, Calif.

C. Carleton Semple, general manager of Compania Minas Matagalpa, has returned to Nicaragua after a trip all the way by rail from Nicaragua to New York and several months' stay in the States. He reports that all the gold mines in Nicaragua, about ten, con-

This Tri-State group, looking as though they had just swallowed the canary—or heard about an increase in production premiums—comprises, from left to right, George M. Fowler, Joplin geologist; Commander Lee, RAF; James K. Richardson, secretary of the Tri-State Zinc and Lead Ore Producers Association; Fred F. Netzeband, association air-hygiene engineer; and Jack Dunlop, American Zinc, Lead & Smelting Co., formerly with the U. S. Bureau of Mines at Joplin.

tinue working and there is some possibility that they may continue in operation through at least part of 1943 if supplies are allocated to them under the recent provisions of what is called the Project Export Licensing.

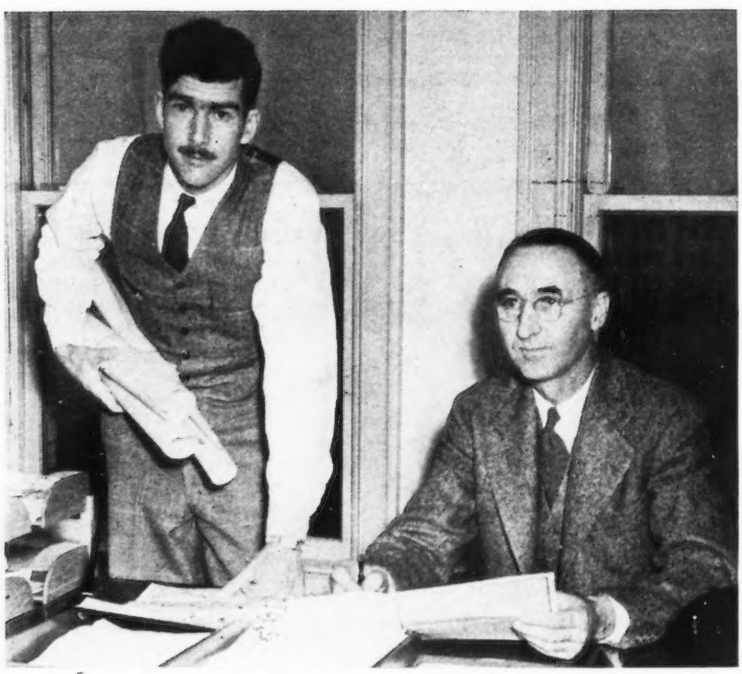
J. van den Broek, president of the Tin Processing Corp., which is operating the new government tin smelter in Texas, has resigned to become Finance Minister of the Netherlands. Mr. van den Broek will be succeeded by **J. van den Berg. Ethelbert Warfield,** of the law firm of Satterlee & Warfield, has been elected chairman of the board. **J. B. Peyrot,** who will succeed Mr. van den Broek as one of the managing directors of N. V. Billiton Maatschappij, will continue as vice president of the Tin Processing Corp.

R. A. Angst, superintendent of the Montreal Mining Co., at Montreal, Wis., on the Gogebic range, retired on Dec. 1, according to an announcement by Oglebay, Norton & Co. Mr. Angst reached the age of retirement after 43 years of active service in the mining business. He started his mining career in 1899 with the Oliver Mining Co., and for the past 30 years had been associated with Oglebay, Norton & Co. **R. A. Bowen,** who had been Mr. Angst's assistant for the past 20 years, will succeed him as superintendent.

E. P. Frink, formerly assistant general manager of Sominar, S. A. (wolfram mines), is now metallurgist in the mining research department of the Corporación para la Promoción del Intercambio, S. A., at Rivadavia 733, Buenos Aires, Argentina. The main mine of Sominar is at Concaran, in the Province of San Luis, Argentina. The last-mentioned firm, with the staff, of which Mr. Frink is now associated, is a corporation formed to promote interchange of commerce between the American countries and is devoting its energies to stimulation of local production of materials that are urgently needed in the United States.

Charles H. Fulton, distinguished retired teacher of metallurgy, has been appointed head of the metallurgy department of the Montana School of Mines. He will take the place, for the duration of the war, of **Prof. John P. Spielman,** who is now an officer in the Air Corps. Dr. Fulton has been connected with the faculties of Columbia, Wyoming, South Dakota School of Mines, Case School of Applied Science, and Missouri School of Mines and Metallurgy. He was director of the latter institution from 1920 to 1937, and upon retirement was appointed research professor of metallurgy.

Dr. Byron N. Cooper and **Dr. William R. Brown,** two geologists, have been added to the staff of the Virginia Geological Survey. Dr. Brown, who received his Ph.D. degree from Cornell University, is engaged in studies of the mineral resources of Piedmont Virginia, especially those useful to war industries. Dr. Cooper, who received his Ph.D. degree from the University of Iowa, is in charge of studies on the stratigraphy, structure, and nonmetallic mineral resources in the southern half of the Appalachian Valley in Virginia. **Dr. Raymond S. Edmundson,** for some years a staff geologist, is in charge of similar studies in the northern half of the valley.



Four important government agencies to encourage mine development in the Northwest have recently been established in Spokane, Wash. Phil J. Shenon is in charge of the U. S. Geological Survey office, in the Peyton Building. He was chief geologist in the National Geographic exploration of the Salmon River, the River-of-No-Return, a few years ago. In the picture, he is seated on the right. J. J. Collins, assistant regional geologist for the four Northwestern states, is shown standing

OBITUARY

Robert Peele, professor emeritus of mining engineering in the School of Mines, Columbia University, died on Dec. 8, aged 84. An appreciation of his life and work will appear in an early issue.

William H. McArdle, mining engineer, an alumnus of the Columbia School of Mines, Class of 1912, died on Nov. 3, in New York, at the age of 55.

Fred Stoll, a mining engineer of Superior, Ariz., died on Oct. 29 in that city. Mr. Stoll returned last year from a three-year engagement in the Philippines.

Prof. Marcus Stults Farr, 72, associate professor emeritus of the department of biology and geology at Princeton University, died recently at Princeton, N. J.

Herman Marquardt, well known in mining circles of Idaho, died recently at his home in Wallace. He was president of Clayton Silver Mines, operating at Clayton, Idaho.

William Walter Fischer, of Memphis, Tenn., chairman of the board of the Batesville (Arkansas), White Lime Co., died recently at Memphis. Mr. Fischer was also president of the Fischer Lime & Cement Co., of Memphis.

W. F. Ulrich, formerly superintendent of the Trout Lake concentrator of the Oliver Iron Mining Co. at Coleraine, Minn., died Oct. 27. He became superintendent of the concentrator in 1923 and retired a year ago, being succeeded by **William L. Kendrick.**

Bennet B. Bristol, a mining engineer of the Stevens Institute of Technology, Class of 1893, who, with his brother, Edgar H. Bristol, founded the Industrial Instrument Co., in 1908, later the Foxboro Co., Foxboro, Mass., died on Nov. 10 at Falmouth Heights, Mass., in his 74th year.

Henry Nourse, Rand pioneer, died at Johannesburg early in October. He was 85. He organized the Nourse Gold Mining Co. and the Henry Nourse Deep Level G. M. C., which were consolidated into the present Nourse Mines, Ltd., of which he was a director at the time of his death.

Cyrus F. Tolman, 69, professor emeritus of economic geology at Stanford University, died on Oct. 13 last. He had been on the faculty of the university since 1912, retiring in 1938. He was a member of the Geological Society of America, the A.I.M.E., and other technical societies.

Arthur V. Card, vice president and treasurer of the C. S. Card Iron Works Co., Denver, Colo., crashed to his death on a colorado mountain, last fall while piloting his own airplane. He had been associated for 22 years with the company, founded by his father, and had contributed important improvements in mine-haulage and other technical mine equipment.

Oliver Curtis Martin, copper metallurgist distinguished in the United States by his services with the American Smelting & Refining Co. at Denver and Perth Amboy, N. J., and with Nichols Copper at Laurel Hill, L. I., and who developed the copper industry at Oolen, Belgium,

for the Société Générale de Belgique, died at Plainfield, N. J., on Nov. 17. He was 68.

L. V. ("Judge") Root, editor of the *Mohave County Miner,* pioneer mining-town newspaper man of the West, at one time publisher of the *Needle's Eye,* at Needles, Calif., and the *Gallup News,* at Gallup, N. M., died on Nov. 11 at Kingman, Ariz., at the age of 73.

Charles Leonard Palmer, mining engineer and consultant, was recently killed in an air accident to the flying boat "Clare," on the way from Ankara, Turkey, to England. Mr. Palmer had been identified with many and varied mining projects and was consultant and adviser to Eti Bank at Ankara.

Robert W. Barrell, mining engineer and assayer, and until his retirement in 1935 president of the St. Louis Sampling & Testing Works, died early in the past summer, at the age of 75. Mr. Barrell was a graduate of Lehigh University and had had extensive professional experience in the Western states and in the mid-West.

William R. Elden, of Bogota, N. J., died Sept. 2, 1942, at the age of 59. Formerly chief engineer for Sauerman Bros., Chicago, he later opened his own office in New York City, where he represented that firm and other manufacturers of material-handling machinery.

Harry L. Day, a pioneer in the development of the Coeur d'Alene mining region of Idaho, civil leader, newspaper man, and philanthropist, died at Las Palmas, Calif, on Nov. 17 at the age of 76. His last written request follows: "Inasmuch as I have lived a full and active life, embracing the whole gamut of human relations, and have passed the allotted span of human existence, I request of my relatives and friends that no undue mourning be felt or shown. Gladly did I live and gladly I die."

Robert Linton, consulting industrialist and mining engineer, died in Los Angeles on Nov. 12 at the age of 72. Mr. Linton was formerly president of North Butte Mining Co. and recently had been associated with Metals Reserve Co. and other Washington governmental agencies. He was born at Hudson, Ohio, and received his education at Washington and Jefferson College, at Washington, Pa., and at the Imperial Polytechnic School at Berlin, Germany. He was a member of many civic and professional organizations, including the A.I.M.E.

John Henry Hand, 72, Yellville, Ark., mining engineer and geologist, died recently at Little Rock, Ark. A member of the American Mining Congress since 1906, he had served several years on its board of governors. During the past 25 years he had devoted most of his time to the development of the northern Arkansas zinc fields. He was the author of many articles concerning this district. His other activities include that of editor of the *Mountain Eagle,* at Yellville, past president of the Arkansas Press Association, and past president of the White River Chamber of Commerce. He was an authority on minerals of the North Arkansas section.

T. Skewes Saunders, 63, for many years a prominent consulting mining engineer of Mexico City, died there on Oct. 25th last. Mr. Saunders was a British subject, educated at Camborne School of Mines, Cornwall, England. He had worked in Cornwall tin mines and in the United States, and was professionally identified with six prominent Mexican mining enterprises prior to opening consulting offices in Mexico City. He served, also, on the boards of many mining groups. Mr. Saunders was a member of the British Institution of Mining and Metallurgy, the A.I.M.E., and other technical societies, and of the British Society of Mexico, the British Chamber of Commerce, and the University, British, and American clubs. He was active in civic and charitable affairs.

Dr. Fernand Holweck, director of research of the Centre National de la Recherche Scientifique and associate professor of physics at the Institute of Radium of the Sorbonne, was murdered on Dec. 14, 1941, in a Paris prison by the Gestapo, Hitler's secret police. Born in 1889, Dr. Holweck was graduated in physics from the Ecole de Chemie et Physique, of Paris. He became assistant to Madame Curie in 1912 and devoted all his activity to the Curie laboratory. He invented the molecular pump, the most powerful vacuum-producing device prior to the invention of vapor diffusion pumps; a high-power radio tube which could be disassembled; the first X-ray tube with successive stages of acceleration; the focusing of electrons in television work; and the Holweck gravimetric pendulum. He worked with others on the detection of submarines with ultra-sonic waves and on a special machine gun for aircraft. It is believed that the Gestapo tortured and murdered Dr. Holweck in an effort to discover the secrets of some of his war inventions.

Dr. Frederick M. Becket, distinguished pioneer in the electrometallurgical industries, consultant metallurgist and electrochemist for Union Carbide & Carbon Corp., and formerly an official of that corporation's affiliated units, died in New York on Dec. 1 at the age of 67. An appreciation of his great contributions to industry and science will appear in the January, 1943, issue of *Engineering and Mining Journal.*

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LETTERS

Mining and Post-War Policies

The Editor:

I HAVE BEEN much interested in reading proof of your thoughtful and well-written editorial on "Mining and Post-War Policies." In the peace settlement following the first World War, the contribution of the mining industry did not amount to much. So far as mining was considered at all, it was by economists, politicians, and others who were not familiar with the field. It seems to me that you will perform a real service if you can help in getting some thought started on this subject.

As you say, the mining industry is most interested in Article IV of the Atlantic Charter, on the equality of access to raw materials. Unless the promise of equality of access can be really fulfilled, it is bound to have some bad repercussions. There has always been a certain kind of equality of access, in that minerals have been available to anybody in the world who had the price to pay for them. The real complaint about inequality has been due to the fact that costs have not been equal to all nations, principally because of geographic distribution of mineral deposits, and because there are great inequalities of political and commercial control. No new geographic partitioning can correct this situation. Neither can it be corrected by the removal of trade barriers. Even if equality were possible, it would not satisfy warlike nations whose real aim is not equality but dominance. We must remember, also, that nearly all of the so-called trade barriers, such as tariffs, cartels, and other commercial policies, have certain worthy objectives, even though they may have been at times abused, and their removal would bring back certain evils they were supposed to correct. Also, their removal would not touch the real culprit, Nature herself, responsible for inequalities of geographic distribution.

Frankly, I am skeptical about the possibility of agreement on any formula which will satisfy all nations or all industries. The history of the efforts to meet the problem by sweet reason has been a sad one. The Axis powers have made it perfectly clear that they are out for all or nothing so far as raw materials are concerned, and we may be sure that if they win the war they will use the control of raw materials to maintain *their* kind of peace. If the United Nations win the war and maintain or extend their already predominant control of mineral raw materials, why not use this control to maintain *our* kind of peace?

The idea of *enforcement* of peace is rapidly gaining headway. It is even recognized as a temporary necessity in Article VIII of the Atlantic Charter itself. The control of raw materials is perhaps the most powerful single weapon to implement enforcement. Let's use it. The mere announcement of intention will not suffice. It will be a difficult and complicated job, requiring long and detailed planning.

C. K. LEITH

Wardman Park Hotel,
Washington, D. C.

The Editor:

THE ATLANTIC CHARTER—now extended to cover the globe—is a noble and inspiring document, fully worthy of its progenitors, Roosevelt and Churchill. It was, of course, primarily designed to give hope and encouragement to the oppressed peoples of occupied Europe, and the extension of its coverage to Asia and Africa according to the President's recent reply to Wendell Willkie's challenge was inescapable.

However, like all great generalizations

(*Continued on page* 115)

MONTHLY COMMENT • DAILY AND AVERAGE MONTHLY

Summary of the

MARKETS

THE new Controlled Materials Plan attracted only mild interest among producers of major non-ferrous metals. Copper and aluminum will be the first non-ferrous metals to come under the program, which becomes effective at the beginning of the second quarter of 1943. Producers saw no reason for getting disturbed about the new plan, because, just as at present, they will have no hand in allocating their products. Consumers, however, will have to operate within the available supply of materials to meet approved schedules.

The Office of Price Administration has established ceiling prices on manganese and chrome ores sold to the domestic trade. Manganese ore quotations, effective Nov. 9, are quoted on the basis of f.o.b. cars, Atlantic and Gulf ports. Prices listed on the following page cover usual Atlantic ports (Baltimore, Norfolk, Philadelphia, and New York). Prices named for Mobile and New Orleans are 5c. lower than those established for points on the Atlantic.

Chrome ore, 48 percent chromic oxide, 3 to 1 ratio, on Nov. 9 was established at $43.50 per long ton, f.o.b. cars, New York, Philadelphia, Baltimore, Charleston, S. C., Portland, Oregon, and Tacoma, Wash.

Copper deliveries moved into new high ground in the last month, indicating that consumption has increased further on completion of new brass mills. The outlook for civilian use of copper for 1943 is not good. According to Leon Henderson, head of Civilian Supply as well as OPA, his requests for copper for civilian needs in the next year will be less than three-quarters of 1 percent of the available supply. Prices on both domestic and foreign copper were unchanged during November.

The conservation order for lead was revised on Nov. 11. Expansion in use of the metal as a substitute material will not be large, the industry believes, as few big-tonnage items were included in the revised order. The call for lead from regular customers was good throughout the month, with buyers again increasing their inventories under modified regulations of the lead division of WPB. Lead supplies remain ample. Metals Reserve will settle for over-quota lead in concentrates produced in the Tri-State district on the basis

UNITED STATES MARKET

1942 Nov.	Electrolytic Copper: Domestic (a) Refinery	Electrolytic Copper: Export (b) Refinery	Straits Tin: New York	Lead: New York	Lead: St. Louis	Zinc: St. Louis
2	11.775	11.700	52.000	6.50	6.35	8.25
3	Holiday	11.700	Holiday	Holiday	Holiday	Holiday
4	11.775	11.700	52.000	6.50	6.35	8.25
5	11.775	11.700	52.000	6.50	6.35	8.25
6	11.775	11.700	52.000	6.50	6.35	8.25
7	11.775	11.700	52.000	6.50	6.35	8.25
9	11.775	11.700	52.000	6.50	6.35	8.25
10	11.775	11.700	52.000	6.50	6.35	8.25
11	Holiday	11.700	Holiday	Holiday	Holiday	Holiday
12	11.775	11.700	52.000	6.50	6.35	8.25
13	11.775	11.700	52.000	6.50	6.35	8.25
14	11.775	11.700	52.000	6.50	6.35	8.25
16	11.775	11.700	52.000	6.50	6.35	8.25
17	11.775	11.700	52.000	6.50	6.35	8.25
18	11.775	11.700	52.000	6.50	6.35	8.25
19	11.775	11.700	52.000	6.50	6.35	8.25
20	11.775	11.700	52.000	6.50	6.35	8.25
21	11.775	11.700	52.000	6.50	6.35	8.25
23	11.775	11.700	52.000	6.50	6.35	8.25
24	11.775	11.700	52.000	6.50	6.35	8.25
25	11.775	11.700	52.000	6.50	6.35	8.25
26	Holiday	11.700	Holiday	Holiday	Holiday	Holiday
27	11.775	11.700	52.000	6.50	6.35	8.25
28	11.775	11.700	52.000	6.50	6.35	8.25
30	11.775	11.700	52.000	6.50	6.35	8.25
			AVERAGES FOR MONTH			
Nov	**11.775**	**11.700**	52.000	6.50	**6.35**	**8.25**
Nov.			AVERAGES FOR WEEK			
4	11.775	11.700	52.000	6.50	6.35	8.25
11	11.775	11.700	52.000	6.50	6.35	8.25
18	11.775	11.700	52.000	6.50	6.35	8.25
25	11.775	11.700	52.000	6.50	6.35	8.25
Nov.			CALENDAR WEEK AVERAGES			
7	11.775	11.700	52.000	6.50	6.35	8.25
14	11.775	11.700	52.000	6.50	6.35	8.25
21	11.775	11.700	52.000	6.50	6.35	8.25
28	11.775	11.700	52.000	6.50	6.35	8.25

SILVER, GOLD AND STERLING EXCHANGE

1942 Nov.	Sterling Exchange: "Checks" (Nominal)	Sterling Exchange: "90-day demand"	Silver (c): New York	Silver (c): London	Gold: London	Gold (d): United States
2	401.000	(f)	44.750	23.500	168s	$35.00
3	Holiday	(f)	Holiday	23.500	168s	Holiday
4	401.000	(f)	44.750	23.500	168s	35.00
5	401.000	(f)	44.750	23.500	168s	35.00
6	401.000	(f)	44.750	23.500	168s	35.00
7	401.000	(f)	(e)	(e)	(e)	35.00
9	401.000	(f)	44.750	23.500	168s	35.00
10	401.000	(f)	44.750	23.500	168s	35.00
11	Holiday	(f)	Holiday	23.500	168s	Holiday
12	401.000	(f)	44.750	23.500	168s	35.00
13	401.000	(f)	44.750	23.500	168s	35.00
14	401.000	(f)	(e)	(e)	(e)	35.00
16	401.000	(f)	44.750	23.500	168s	35.00
17	401.000	(f)	44.750	23.500	168s	35.00
18	401.000	(f)	44.750	23.500	168s	35.00
19	401.000	(f)	44.750	23.500	168s	35.00
20	401.000	(f)	44.750	23.500	168s	35.00
21	401.000	(f)	(e)	(e)	(e)	35.00
23	401.000	(f)	44.750	23.500	168s	35.00
24	401.000	(f)	44.750	23.500	168s	35.00
25	401.000	(f)	44.750	23.500	168s	35.00
26	Holiday	(f)	Holiday	23.500	168s	35.00
27	401.000	(f)	44.750	23.500	168s	35.00
28	401.000	(f)	(e)	(e)	(e)	35.00
30	401.000	(f)	44.750	23.500	168s	35.00
			AVERAGES FOR MONTH			
Nov.	**401.000**	.....	44.750	23.500	....	**35.00**
Nov.			AVERAGES FOR WEEK			
4	401.000	.....	44.750	.....	....	.....
11	401.000	.....	44.750	.....	....	.....
18	401.000	.....	44.750	.....	....	.....
25	401.000	.....	44.750	.....	....	.....

Calendar week averages, New York Silver: Nov. 7th, 44.750; 14th, 44.750; 21st, 44.750; 28th, 44.750.
(e) Not quoted (Saturday). (f) No quotations.

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.225c. per pound, the average differential for freight and delivery charges.

(b) Export prices are net at refineries on the Atlantic seaboard and include sales of domestic copper in the foreign market. Owing to the World War and the disruption of normal trade relations, our export copper quotations, since September, 1939, have been based largely on f.a.s. transactions, ex United States ports. We deduct .05c. from the f.a.s. basis (lighterage, etc.) to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West in nearly all instances command a premium of 1c per pound over the current market for Prime Western but not less than 1c over the *Engineering and Mining Journal's* average quotation for Prime Western for the previous month.

Quotations for lead reflect prices obtained for commond lead, and do not include grades on which a premium is asked.

(c) Silver other than newly-mined domestic, by Handy & Harman. Under Treasury order of July 6, 1939, the price on domestic newly-mined silver mined subsequent to July 1, 1939, was fixed at 71.11c per troy ounce. Handy & Harman's quotation on newly-mined domestic silver, 999 fine was 70⅝c. throughout November.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold in domestic and imported ore or concentrate is at 99.75 per cent of the price quoted by the Treasury, which at present is equal to $34.9125.

of $41.80 per ton, instead of $39.60, effective Dec. 1.

Use of zinc in galvanized ware was curtailed during the last month. Call for High Grade is absorbing the entire output of that grade. Lend-lease demands have been large. Premium payment on over-quota production of zinc concentrate in the Tri-State after Dec. 1 will be made on the basis of $29.70 per ton, against the former rate of $28.05. The modest advance in the premium was viewed as an adjustment rather than a spur to production.

Small tungsten producers will obtain $30 per short ton unit of WO_3 from Metals Reserve, against the former price of $24. The higher price is expected to lift production.

●

LONDON TIN—Trading in Standard tin in London remained suspended throughout November.

OFFICIAL LONDON PRICES—COPPER, LEAD, ZINC

Following are the maximum prices of copper, lead, and zinc established by the Ministry of Supply for the British market, in effect since Dec. 18, 1939:

	Per £	Long s.	Ton d.
COPPER:			
Electrolytic, high conductivity	62	0	0
Fire refined, high conductivity	62	0	0
Fire refined, high grade	61	10	0
Fire refined, min. 99.7 per cent	61	0	0
Fire refined, min. 99.2 per cent	60	10	0
Hot rolled black wire rods	65	10	0
LEAD:			
Soft foreign, duty paid	25	0	0
Soft, Empire	25	0	0
English refined	26	10	0
ZINC:			
Foreign (G.o.b.), duty paid	25	15	0
Domestic (G.o.b.)	26	10	0
Prime Western and debased	26	10	0
Refined and electrolytic	27	5	0
Minimum 99.99 percent	28	15	0

Quotations are for metal delivered to the consumer.

E & M J PRICE INDEX

Weighted index of non-ferrous metal prices. The average for the years 1922-1923-1924 equals 100.

1929	110.33	1935	74.66
1930	82.87	1936	73.45
1931	60.20	1937	90.86
1932	48.26	1938	73.67
1933	59.79	1939	77.71
1934	69.59	1940	79.22
		1941	83.49

	1940	1941	1942
January	80.85	82.48	85.39
February	77.23	82.76	85.90
March	77.94	83.27	85.90
April	77.19	83.48	85.90
May	77.68	83.51	85.90
June	78.85	83.48	85.90
July	76.72	83.60	85.90
August	76.71	83.39	85.90
September	79.40	83.34	88.74
October	82.49	83.84	88.74
November	83.14	84.32	88.74
December	82.42	84.42	....

CURRENT PRICES — MISCELLANEOUS METALS, ORES, AND NON-METALLIC MINERALS

Quotations cover wholesale lots, prompt shipment, f.o.b. New York, unless otherwise stated

(December 1, 1942)

MISCELLANEOUS METALS

Aluminum, ingot, 99 plus per cent, lb	15c.
Antimony, domestic, spot, lb. 5 ton or more	16.013c.
Bismuth, ton lots, lb	$1.25
Cadmium, commercial sticks, lb	90c.
Calcium, lb., ton lots 97 @ 98 per cent	$1.25
Chromium, 97 per cent grade, lb	89c.
Cobalt, 97 to 99 per cent, per lb	$1.50
Nickel, electrolytic cathodes, lb	35c.
Magnesium, 99.8 per cent, carloads, lb	22½c.
Palladium, troy oz	$24.00
Platinum, (Official quotation) troy oz	$36.00
Quicksilver, flask of 76 lb., 100 flasks or more	$196.00@$198.00
Radium, mg. radium content	$25.00@$30.00
Selenium, 99.5 per cent, lb	$1.75
Silicon, minimum 97 per cent, spot, carloads lb	14.75c.
Tellurium, lb	$1.75
Thallium, 100 lb. or more, lb	$10.00
Titanium, 96 to 98 per cent, lb	$5.00

METALLIC ORES

Beryllium Ore, 10 to 12% BeO. f.o.b. mines, ton	$35.00@$40.00
Chrome Ore. per long ton, f.o.b. cars Atl. ports, dry, 48% Cr_2O_3, 2.8 to 1 ratio	$41.00
48% Cr_2O_3, 3 to 1 ratio	$43.50
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$4.75
Mesabi bessemer	$4.60
Old Range non-bessemer	$4.60
Mesabi, non-bessemer	$4.45
Lead (Galena) 80 per cent, Joplin, Mo., ton	$76.54
Manganese (dutiable) f.o.b. cars Atl. ports, long ton unit Mn:	
50 per cent	79.8c.
48 per cent	78.8c.
46 per cent	76.8c.
Manganese Ore, domestic, 48%, f.o.b. mines, l.t. unit	96c.@$1.00
Molybdenum Ore, 90%, per lb. of MoS_2, f.o.b. mines	45c.
Tungsten Ore, per unit of WO_3:	
Chinese, 65 per cent, duty paid	(b) $24.00
Domestic, 65 per cent and upward	(a) $26.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	27.59c
Zinc Ore, Prime, 60 per cent concentrate, Joplin, Mo; per ton	$55.28
(a) Prices at mines, small lots, usually several dollars less	(b) Nominal

METALLIC COMPOUNDS

Arsenious Oxide (arsenic) lb	4c.
Cobalt Oxide, 70 @ 71 per cent, lb	$1.84
Copper Sulphate, 100 lb	$5.15
Sodium Nitrate, ex vessel, in 200-lb. bags, per 100 lb	$1.43
Sodium Sulphate, bulk, ton	$18.00@$24.00

ALLOYS

Beryllium Copper, master alloy, 2.5 to 3 per cent Be, per lb. of contained Be	$15.00
Ferrochrome, 65 @ 70 per cent chromium, 4 @ 6 per cent carbon, per pound of Cr contained	13c.
Ferromanganese, 78 @ 82 per cent, gross ton	$135.00
Ferromolybdenum 55 @ 65 per cent Mo. lb. of Mo. contained	95c.
Ferrosilicon, 50 per cent, gross ton	$74.50
Ferrotungsten, 75 @ 80 per cent, lb. of W contained	$1.90
Ferrovanadium, per lb. of V, delivered	$2.70@$2.90
Silicomanganese, 1½ per cent C, gross ton	$135.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canadian (Quebec) mines (U. S. funds), ton:	
Crude No. 1	$650@$750
Crude No. 2	$165@$385
Spinning fibers	$124@$233
Paper stock	$44@$49.50
Shorts	$14.50@$26.50
Vermont, f.o.b. Hyde Park:	
Shingle stock	$62.50@$65.00
Paper stock	$44.00@$53.00
Shorts	$14.50@$28.50
Floats	$19.50
Barytes, long ton:	
Georgia, crude	$9.00
Missouri, 93 per cent $BaSO_4$, less than 1 per cent iron	$6.75@$7.25
Bauxite, long ton:	
Domestic, crude, 50 @ 52 per cent (not dried)	$5.00
Domestic, chemical, 55 @ 58 per cent	$7.50@$8.50
Domestic, abrasive, 80 @ 84 per cent	$16.00
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1, bulk	$6.75@$8.00
Delaware, No. 1	$15.00
Feldspar, bulk, ton:	
Potash feldspar, 200 mesh	$17.00
Glass-spar, white, 20 mesh	$11.75
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois 85–5 per cent, all rail movement, ton	$25.00
Ground, 95 @ 98 per cent, bulk, ton	$34.00
Acid, 98 and 1 per cent, bulk, ton	$35.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton:	
Dead-burned, f.o.b. Washington	$22.00
Mica, per lb., North Carolina, No. 1 and 2 quality:	
1½ x 2 in	90c. @$1.20
2 x 2 in	$1.50@$2.00
3 x 3 in	$2.00@$2.75
3 x 4 in	$2.50@$3.25
3 x 5 in	$3.00@$4.00
White, ground, ton	$60.00@$80.00
Ocher, Georgia, ton	$19.00@$22.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	(a) 12c
Silica, in bags, 325 mesh, ton	$20.00@$40.00
Sulphur, Texas, mines, long ton	$16.00
Talc, f.o.b. works, ton:	
New York, double air-floated, 325 mesh	$12.00@$15.00
New Jersey, mineral pulp	$8.50@$10.50
Vermont, extra white, 200 mesh	$9.50@$10.50
Tripoli Missouri, ton:	
40 mesh, cream colored	$14.50
200 mesh, cream colored	$26.00
(a) Nominal	

IRON AND STEEL

Pig Iron, Valley furnaces, gross ton: Basic	$23.50
Steel, base prices, Pittsburgh:	
Billets, gross ton	$34.00
Structural shapes, 100 lb	$2.10
Bars, 100 lb	$2.15

Monthly and Yearly

AVERAGE PRICES

SILVER AND STERLING EXCHANGE

	New York		London Spot		Sterling Exchange	
	1941	1942	1941	1942	1941	1942
January	34.750	35.125	23.273	23.500	(a) 402.000	(a) 401.000
February	34.750	35.125	23.341	23.500	(a) 401.864	(a) 401.000
March	34.750	35.125	23.446	23.500	(a) 401.788	(a) 401.000
April	34.750	35.125	23.500	23.494	(a) 401.058	(a) 401.000
May	34.750	35.125	23.457	23.500	(a) 400.981	(a) 401.000
June	34.750	35.125	23.400	23.500	(a) 401.000	(a) 401.000
July	34.750	35.125	23.397	23.500	(a) 401.000	(a) 401.000
August	34.750	35.125	23.459	23.500	(a) 401.000	(a) 401.000
September	34.750	44.750	23.500	23.500	(a) 401.000	(a) 401.000
October	34.750	44.750	23.500	23.500	(a) 401.000	(a) 401.000
November	34.772	44.750	23.500	23.500	(a) 401.000	(a) 401.000
December	35.125	.....	23.500	.....	(a) 401.000	.....
Year	34.783	.....	23.439	.....	(a) 401.224	.....

New York quotations for silver other than newly-mined domestic, cents per ounce troy, 999 fine. London pence per ounce sterling silver 925 fine. Sterling exchange (pound sterling) in cents. (a) Nominal.

COPPER

	F.O.B. Refinery, Electrolytic			
	Domestic		Export	
	1941	1942	1941	1942
January	11.819	11.775	10.257	11.508
February	11.794	11.775	10.414	11.700
March	11.814	11.775	10.592	11.700
April	11.820	11.775	10.952	11.700
May	11.815	11.775	10.950	11.700
June	11.810	11.775	10.950	11.700
July	11.812	11.775	10.950	11.700
August	11.778	11.775	10.950	11.700
September	11.775	11.775	11.027	11.700
October	11.775	11.775	11.367	11.700
November	11.775	11.775	11.200	11.700
December	11.775	.....	11.200	.....
Year	11.797	.....	10.901	.....

New York quotations, cents per pound.

LEAD

	New York		St. Louis	
	1941	1942	1941	1942
January	5.500	6.275	5.350	6.125
February	5.602	6.500	5.452	6.350
March	5.765	6.500	5.613	6.350
April	5.850	6.500	5.700	6.350
May	5.850	6.500	5.700	6.350
June	5.850	6.500	5.700	6.350
July	5.850	6.500	5.700	6.350
August	5.850	6.500	5.700	6.350
September	5.850	6.500	5.700	6.350
October	5.850	6.500	5.700	6.350
November	5.850	6.500	5.700	6.350
December	5.850	.....	5.700	.....
Year	5.793	.....	5.643	.....

New York and St. Louis quotations, cents per pound.

TIN

	Straits New York		Standard, Spot London	
	1941	1942	1941	1942
January	50.154	52.000	256.648	(b)
February	51.293	52.000	264.975	(b)
March	52.067	52.000	270.131	(b)
April	51.981	52.000	269.775	(b)
May	52.166	52.000	267.534	(b)
June	52.685	52.000	262.750	(b)
July	53.481	52.000	258.272	(b)
August	52.385	52.000	257.013	(b)
September	52.000	52.000	256.364	(b)
October	52.000	52.000	255.842	(b)
November	52.000	52.000	256.713	(b)
December	52.000	.....	(a) 257.625	.....
Year	52.018	.....	261.137	.....

New York quotations, cents per pound. London, pounds sterling per long ton. (a) Average of 6 days; quotations suspended Dec. 9. (b) Not quoted.

ZINC

	St. Louis			
	1939	1940	1941	1942
January	4.500	5.644	7.250	8.250
February	4.500	5.534	7.250	8.250
March	4.500	5.750	7.250	8.250
April	4.500	5.750	7.250	8.250
May	4.500	5.803	7.250	8.250
June	4.500	6.235	7.250	8.250
July	4.516	6.250	7.250	8.250
August	4.719	6.389	7.250	8.250
September	6.104	6.920	7.250	8.250
October	6.500	7.250	7.942	8.250
November	6.500	7.250	8.250	8.250
December	5.980	7.250	8.250	.....
Year	5.110	6.335	7.474	.....

St. Louis quotations, Prime Western, cents per pound.

CADMIUM AND ALUMINUM

	Cadmium		Aluminum	
	1941 (a)	1942 (a)	1941	1942
January	80.000	90.000	17.000	15.000
February	82.273	90.000	17.000	15.000
March	89.038	90.000	17.000	15.000
April	90.000	90.000	17.000	15.000
May	90.000	90.000	17.000	15.000
June	90.000	90.000	17.000	15.000
July	90.000	90.000	17.000	15.000
August	90.000	90.000	17.000	15.000
September	90.000	90.000	17.000	15.000
October	90.000	90.000	15.000	15.000
November	90.000	90.000	15.000	15.000
December	90.000	.....	15.000	.....
Year	88.443	.....	16.500	.....

Aluminum in cents per pound, 99 plus per cent grade. Cadmium, cents per pound. (a) Producers' price, commercial sticks.

ANTIMONY, QUICKSILVER, AND PLATINUM

	Antimony (a) New York		Quicksilver (b) New York		Platinum (c) New York	
	1941	1942	1941	1942	1941	1942
January	14.000	14.000	165.846	202.519	36.000	36.000
February	14.000	14.000	170.182	197.272	36.000	36.000
March	14.000	14.602	177.692	197.050	36.000	36.000
April	14.000	15.991	180.077	197.098	36.000	36.000
May	14.000	16.013	180.000	197.300	36.000	36.000
June	14.000	16.013	183.920	194.282	36.000	36.000
July	14.000	16.013	188.577	194.430	36.000	36.000
August	14.000	16.013	192.000	194.430	36.000	36.000
September	14.000	16.013	192.440	194.430	36.000	36.000
October	14.000	16.013	193.615	195.346	36.000	36.000
November	14.000	16.013	196.273	196.000	36.000	36.000
December	14.000	.....	199.654	.....	36.000	.....
Year	14.000	.....	185.023	.....	36.000	.....

(a) Antimony, cents per pound, ordinary brands, in cases; in bulk f.o.b. Laredo, Tex., 14.500 for Nov.; New York equivalent 15.480. (b) Quicksilver dollars per flask of 76 lb. (c) Platinum, per ounce troy.

PIG IRON

	Bessemer		Basic		No. 2 Foundry	
	1941	1942	1941	1942	1941	1942
January	24.50	24.50	23.50	23.50	24.00	24.00
February	24.50	24.50	23.50	23.50	24.00	24.00
March	24.50	24.50	23.50	23.50	24.00	24.00
April	24.50	24.50	23.50	23.50	24.00	24.00
May	24.50	24.50	23.50	23.50	24.00	24.00
June	24.50	24.50	23.50	23.50	24.00	24.00
July	24.50	24.50	23.50	23.50	24.00	24.00
August	24.50	24.50	23.50	23.50	24.00	24.00
September	24.50	24.50	23.50	23.50	24.00	24.00
October	24.50	24.50	23.50	23.50	24.00	24.00
November	24.50	24.50	23.50	23.50	24.00	24.00
December	24.50	.....	23.50	.....	24.00	.....
Year	24.50	.....	23.50	.....	24.00	.....

Iron, dollars per long ton. F.o.b. Mahoning and Chenango Valley furnaces.

News OF THE INDUSTRY

Mining Congress Meets in War Conference on Metal Production

Washington officials join mining men in effort to solve problems of mutual interest and increase production of badly needed metals

MANPOWER AND MATERIALS, twin topics of concern to Washington and the mining industry, were the main subjects of joint discussion at the metal mine war conference of the American Mining Congress at Salt Lake City, Nov. 16-17. Every governmental agency dealing with the metal mining industry was represented by officials in high authority, and industry leaders turned out in impressive numbers from all sections of the country.

The conference successfully provided a forum for exchange of views that led to a better understanding between government and the industry. Constructive criticism was the order of the day. Messages were read from the President, General Somervell, and Donald M. Nelson, emphasizing the prime importance of the mining industry to the success of our armed forces and urging all-out production of essential metals.

Representatives of the Army and Navy Munitions Board spoke of the military requirements of metals and minerals. Commander J. D. Small, U.S.N., recognized the dependence of the armed forces on the mining industry, and Colonel C. V. Morgan, U.S.A., outlined the planned requirements of metals for 1943. In terms of *tons of ore*, not metal, the needs for next year are: antimony, 400,000; chromium, 900,000; manganese, 1,400,000; mercury, 1,400,000; tungsten, 30,000; molybdenum, 13,000,000; vanadium, 45,000,000; copper, 270,000,000; zinc, 35,000,000; beryllium, 5,000.

Wilbur A. Nelson, mining branch administrator, assured the industry that it is receiving the highest priority assistance. Military ratings are available for maintenance and repair materials for the last quarter of 1942, and emergency ratings can be granted on application to WPB in case of breakdowns and for new equipment. Dr. Nelson urged the industry to intensify the scrap drive, to stop the pirating of labor, and to draw on the 4,000 furloughed soldier-miners for their labor supply. He pointed out that, until the new Controlled Materials Plan is put into effect in 1943, the present conservation and limitation orders on materials must prevail.

Sessions on Metals

WPB metal-branch chiefs discussed the situation in copper, lead, zinc, ferroalloy metals, and miscellaneous minerals. Separate sessions were later devoted to each of these topics, also to gold and silver, at which detailed problems were considered by operators and Washington officials.

At a luncheon meeting Col. A. Robert Ginsburg, in charge of industrial production for the Army, reviewed the progress of the war. Answering the question "How are we doing?" he said: "Better than we have a right to expect, but not well enough to feel satisfied." We must do in two years what the Axis has been doing for 10 to 25 years. In 1943 we shall hold the initiative, but meantime we must not belittle the enemy. Senator Pat McCarran, Nevada, made a stirring address on the subject of silver, in which he reviewed the important position of the metal in the war effort. He urged its continued production and the industrial use of the Treasury's supply not required as backing for the currency. He viewed with satisfaction the United States' accumulation of silver, and predicted that it would serve a useful purpose both during and after the war.

The work of the RFC, Metals Reserve Co., and Defense Plant Corp. was reviewed by Charles P. Henderson, president of the first two organizations.

Congressman and Senator-elect James G. Scrugham, Nevada, spoke on "Metals for Munitions." His talk was the occasion for many questions and comments bearing on the problems of the small operator, with particular reference to financial aid and markets for small lots of ore. He promised to speed up the construction of access roads, which he said were being held back by too much red tape. He heard criticism of the cost of processing low-grade tungsten and other ores and of the low rates of payment. He stated his belief that new schedules were being made that would modify the acceptable grades. Encouragement of the prospector was also urged upon him, by making it possible to secure financial aid and supplies. Mr. Scrugham thought that State mining associations could act as clearing houses for prospectors and small operators and assist them in their relations with governmental agencies.

Manpower Problems

Manpower for the mines was the topic of a session addressed by Gen. F. J. McSherry, War Manpower Commission, and Col. H. Arnold Rich, Utah director, Selective Service System. From the speeches of both officers it was apparent that not only mining, but also agriculture, transportation, shipbuilding, and even the scrap metal and junk business, were in head-on collision with the armed forces for manpower. Both made it clear that military requirements must be filled first, followed by essential war industries, with non-essential industries gradually fading out of the picture. Meantime, mining and other essential industries must establish training and replacement programs in anticipation of loss of deferred employees. Manning tables for large companies are an indispensable aid in such planning.

General McSherry expressed the personal view that we must have priorities in manpower as in materials. But whether a national service act will be passed will depend on industry, Congress, and the President. He was in agreement with others on the essentiality of the mining industry, and cited the release of more than 4,000 soldier-miners from the Army for work in the mines. He emphasized the necessity of working through the U. S. Employment Service, where all unemployed men would be registered, and through which labor could be transferred to critical areas.

Quotas and Premiums

Officials of the OPA held a lively session on metal prices, quotas, and premium payments. Donald H. Wallace, assistant administrator, OPA, presented the general philosophy of the present plan, which is to get maximum production without a general price rise, inflation, and increase of the public debt. Instead of allowing the price for the whole supply of metals to rise to the level of the highest-cost producer, it was thought better to establish different prices for different parts of the total supply. Under this policy, prices or quotas must be revised to meet wage and other cost increases.

Jesse L. Maury, OPA premium price analyst for copper, lead, and zinc, stated that 3,650 quotas had been established for 1,550 mines; that 3,200 were zero quotas; that more than 200 quotas had already been revised; and that this process was going on continuously. He explained that wage increases and other

costs would be considered in changing quotas or prices, and that investment in new equipment subsequent to the establishment of quotas would also be considered in determining costs. Mr. Maury also stated that Washington is now considering the advisability of extending the guarantee period on prices from two and one-half years to five, in order to encourage development and exploration in anticipation of a long war. He further announced the purpose of revised Rule 13, which is designed to compensate shippers to custom mills and smelters on the basis of metal content of the ore, without reference to custom contracts and recoveries.

Considerable discussion followed Mr. Maury's talk, in which Senator McCarran brought up the necessity of postwar tariffs on important metals, and received hearty endorsement of his position. E. H. Snyder asked whether overtime costs incurred by keeping miners at the face for another hour per day would be considered in establishing quotas and premiums, and was assured that total costs, not wage rates, would be the determining factor.

Controlled Materials Plan

At a session of equipment manufacturers, Lane W. Hildreth, chief, machinery division, Mining Branch, WPB, discussed the problems of materials supply, which is daily becoming more difficult, and explained the new Controlled Materials Plan for 1943. (See p. 45)

C. H. Mathewson Elected President of A.I.M.E.

THE American Institute of Mining and Metallurgical Engineers has announced the election of C. H. Mathewson, chairman of the department of metallurgy of Yale University, as president for 1943. Other officers elected were: E. V. Daveler, Utah Copper Co., and Harvey S. Mudd, consulting engineer, as vice presidents; and H. J. Brown, consulting engineer; Charles H. Herty, Jr., Bethlehem Steel Co.; O. H. Johnson, Mines & Smelter Supply Co.; Russell Paul, New Jersey Zinc Co.: F. A. Wardlaw, Jr., International Smelting & Refining Co.; and Felix Wormser, Lead Industries Association, as directors.

Homestake Gets Stay Of Shutdown Order

ON NOV. 24, Dr. A. N. Holcombe, chairman of the WPB appeals board, announced that the plea of Homestake Mining Co., the country's largest gold producer, to delay effectuation of the WPB order closing all but very small gold mines, had been granted to the extent of permitting mining and milling of ore already broken until June 7, six months after the effective date of the order.

No decision was announced in regard to the similar plea of Cripple Creek mines to continue operations on a limited scale to prevent disruption of the communities completely dependent on gold mining.

Industrial Hygiene Group Considers Manpower

UNDER the chairmanship of Andrew Fletcher, vice president of St. Joseph Lead Co., the Industrial Hygiene Foundation held its seventh annual meeting at the Mellon Institute, Pittsburgh, on Nov. 11 and 12. The program comprised timely topics appropriate to industry's war effort, on the general theme "Keep War Workers Well."

Paul V. McNutt, chairman of the War Manpower Commission, gave the Keynote address on "Manpower Conservation." With emphasis on our dependence on manpower to utilize our vast physical resources, he said: "We cannot afford to lose a single day of work or a single worker." Hence the importance of conserving health and industrial efficiency. Because the manpower problem is national in scope, we must ration essential skills as well as labor and distribute them where they are needed. As to hours of work, he stated that eight government agencies believe that the 8-hour day and 48-hour week give the best schedule for the health, safety, and efficiency of the industrial army.

A panel discussion of fatigue in industry with special reference to hours of work and rotation of shifts brought out the unanimous opinion of industrial and medical authorities that rapid rotation of shifts is the worst cause of fatigue. The longer the period of rotation, the better; monthly is better than fortnightly. The following shift timing was recommended as causing the least displacement of customary sleeping and recreation periods: noon to 8:00 p.m., 8:00 p.m. to 4:00 a.m., and 4:00 a.m. to noon.

Combating Silicosis

Supplementing work begun cooperatively in 1939 by the Banting Institute and the MacIntyre-Porcupine mine, Canada, on the use of aluminum powder in combating silicosis, Dr. J. L. Blaisdell reported on more recent studies. The original proposal having been advanced as a preventive but not a cure of silicosis, Dr. Blaisdell undertook the treatment of known cases of uncomplicated silicosis in the hope that the use of aluminum dust might act as a therapeutic agent in the cure of the disease. He examined the selected 50 cases who were exposed to dusty working conditions throughout the period of treatment. This consisted of inhaling freshly ground aluminum powder, particle size 5 microns or less, for periods beginning at 5 minutes per day and increasing to 30 minutes per day. Of the 50 cases, 34 have completed 250 to 300 treatments. Of the 34 cases, definite clinical improvement was shown in 19, and the other 14 showed that the disease had not progressed. Dr. Blaisdell expressed the belief that the inhalation of aluminum dust would prevent silicosis and ameliorate the condition of known silicotics.

On the subject of disability in silicotics, Dr. George W. Wright reported on his tests and observations on miners of the Republic Steel Co. Using a control group of 21 men, 48 silicotics, and 21 pre-silicotics, all doing a day's work in the mines, he subjected them to a series of tests, and concluded that uncomplicated silicosis does not produce disability, although it modifies the ability to work.

Reduction of Absenteeism

At a session presided over by Dr. R. R. Sayers, director, Bureau of Mines, various causes and remedies for absenteeism were discussed. Sickness of different kinds, the common cold, hours of work, working conditions, rotation of shifts, food, housing, and accidents are contributory causes. There was unanimous agreement on the complicated nature of the problem and on the consequent needs of accurate records to provide a basis for intelligent study and solution.

Other topics discussed included the employment of women and older men in industry, and methods of rehabilitating the physically handicapped. A basic plan for industrial deferments, which met the approval of Selective Service and Manpower Commission authorities, was presented by Dr. R. J. Greenly, of the Carnegie-Illinois Steel Corp. The success of the plan is attested by the fact that steel production has been maintained unimpaired, although the corporation has lost over 20,000 men to various branches of the national armed forces.

Activities of National Labor Relations Board

PURSUANT to elections held by the National Labor Relations Board, the board has certified the United Steelworkers of America as bargaining agent for the following: Buck, Bengal, James, Mahnomen, Balkan, and Curry mines of Pickands, Mather & Co. et al.; Greenwood and Morris mines of Inland Steel; Mesabi Chief and Wabigon mines of Hanna Ore Mining Co.; Penokee mine of Penokee Ore Co.; Webb mine of Snyder Mining Co.; and the Susquehanna mine of the Susquehanna Ore Co. All these properties are Lake Superior region iron mines. The board also designated the International Union of Operating Engineers (AFL) as agent for mill employees and the I. W. W. for mine employees of the U. S. Vanadium Corp. operations in Inyo County, Calif. At the Alton lead smelter of American Smelting & Refining Co. the A. F. of L. unions were designated to represent various trades engaged in plant maintenance and District 50, United Mineworkers of America, to represent production employees and maintenance employees not organized in A. F. of L. craft unions.

The board reported that employees of the Grandview mine and mill of American Zinc, Lead & Smelting Co. had voted for no union in preference to the International Union of Mine, Mill and Smelter Workers, CIO. Elections were ordered for three western Kentucky fluorspar mining operations, National Fluorspar Co., Shelley Patton, and Hillside Fluorspar Mines Co. The board's trial examiner recommended disestablishment of independent unions at the Bingham Canyon mine and the Arthur and Magna mills of Utah Copper Co.

THESE are the real footsteps to Victory . . . the marching feet of fighting men, now heard across the embattled continents. Yet these men cannot fight unaided. Each step a soldier takes needs the fullest backing here at home. We must sacrifice, we must work, we must save.

Here, for example, are four very simple conservation steps which you can take on the march to final victory. Follow them and make your storage batteries last longer. Buy to last, and save to win!

STEP No. 1 Keep adding approved water at regular intervals. Most kinds of local water are safe in an Exide Battery. Ask us if yours is safe.

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STEP No. 3 Keep the battery fully charged—but avoid excessive overcharge. There's always a right way to do any job, and a storage battery will last longer when charged at its proper voltage.

STEP No. 4 Keep records of water additions, voltage, and gravity readings. Don't trust your memory. Write down a complete record of your battery's life history. Compare readings. Know what's happening!

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RFC Reports Vast Activities in Stimulating Mineral Output

Statement of Charles B. Henderson, chairman, covering production of domestic metals and minerals needed for war purposes

EVER-INCREASING NEEDS of the nation's war machine for minerals and metals raised the total of Reconstruction Finance Corp. commitments in the domestic production and acquisition of these strategic materials to $3,990,038,900 to Oct. 26, 1942.

Keeping abreast of expanding war production needs, Reconstruction Finance Corp. and its two subsidiaries directly engaged in the program of producing, acquiring, processing and stockpiling metals and minerals—Metals Reserve Co. and Defense Plant Corp.—increased commitments in this field alone by $1,110,354,900 since April 30, 1942.

Commitments made to Oct. 26, 1942, which tend to promote the domestic production of minerals and metals were:

Metals Reserve Company	$1,787,693,300.
Defense Plant Corporation	2,003,440,800.
RFC Loans:	
Loans under Section 5d of the RFC Act, as amended	190,700,700.
Mining Loans	8,204,100.
	$3,,990,038,900.

The above figures do not include Metals Reserve Co. commitments for the purchase of 32 different metals and minerals in 36 separate foreign countries. Nor do they include commitments of $6,190,805,104. made by Defense Plant Corp. in war activities other than in the minerals and metals program.

Aluminum and Bauxite

Defense Plant Corp. has made commitments aggregating $666,718,307 related to the aluminum program. The additional capacity for the production of aluminum provided by Defense Plant Corp. alone is about three times the total United States aluminum output of 1940.

To insure the aluminum industry against any possible interruption in production by curtailment of its ocean-borne bauxite supply, which is normally 60 percent of requirements, domestic bauxite production has been tripled during the past six months, and is now substantially in excess of 1941 requirements from both domestic and foreign sources.

Chrome

The existence of a major deposit of chrome ore in Stillwater County, Mont., has been proved by exploratory work of the U. S. Geological Survey and the U. S. Bureau of Mines. In this area two properties are being operated by Anaconda Copper Mining Co. as agent for Metals Reserve Co., and construction of the necessary milling plants for production of concentrates is being financed by Defense Plant Corp. The combined plant capacity on these two properties, of which one unit is in operation, will be more than five times the previous peak output of chrome concentrates per annum.

In Alaska, arrangements have been made with Alaska-Juneau Gold Mining Co. for mining of a deposit of metallurgical grade chrome in southwestern Alaska and for milling this product in its gold mill at Juneau.

As of Oct. 26, 1942, Metals Reserve Co. had contracted to purchase 480,781 tons of chrome ore from domestic producers under 67 contracts, of which 5 provided for delivery of 10,000 tons or more, and 62 provided for delivery of less than 10,000 tons.

Defense Plant Corp. has made commitments for $16,077,000 for the production of chrome ore and concentrates.

Copper, Lead, and Zinc

Some 2,500 copper, lead, and zinc mines in 27 of the 48 states will benefit from the policy established by Metals Reserve Co., in cooperation with the War Production Board and the Office of Price Administration, of paying a premium, which at present amounts to 5c. a pound for "over-quota" production of copper, and 2¾c. a pound for "over-quota" production of lead and zinc. Quotas are assigned generally on a basis of previous production. Metals Reserve Co. is encouraging the expansion of zinc smelting facilities through agreements to purchase all or a part of the output of two specific smelters and through arrangements to furnish supplies of zinc concentrates to numerous smelters throughout the country.

Defense Plant Corp. has made commitments of $71,987,487 for production of copper, lead, and zinc.

Graphite

Metals Reserve Co. has made contracts for the production of two new graphite properties. Defense Plant Corp. has made commitments of $573,000 for machinery and equipment for the production of crystalline graphite.

Iron and Steel

To Oct. 26, 1942, Defense Plant Corp. has made commitments of $793,354,942 to increase annual iron and steel production. Also, provision has been made for increased capacity of coke and coal mining, iron ore, steel tubing, and for the annealing and heat-treatment of steel.

Magnesium

Commitments made by Defense Plant Corp. will increase total magnesium capacity in the United States to about 40 to 50 times the total amount produced in the country in 1940.

Defense Plant Corp. has made commitments of $370,511,118 for the production of magnesium.

Manganese

It is estimated that domestic manganese production in the early part of 1943 will be eight to ten times the prewar production. This increased production has been achieved largely because of a substantial increase in a manganese operation in Montana. In Nevada, a leaching plant is being constructed under contract with Defense Plant Corp. which is expected to be in production of high-grade sinter in the spring of 1943. Capacity of this plant can be doubled at relatively small expense if emergency requires. Production from the great low grade Chamberlain deposit of South Dakota is being initiated on a scale of 300,000 tons of nodules per annum.

To Oct. 26, 1942, Metals Reserve Co. had entered into 145 domestic contracts for delivery of ores of 35 percent grade or better, 17 calling for the delivery of 10,000 tons or more, and 128 calling for delivery of less than 10,000 tons; encouraged production by increasing the price for domestic manganese ores for the 40 percent to 48 percent grade; permitted the delivery of ore as low in manganese content as 35 percent; and made arrangements in six states for the purchase of milling ores with as little as 15 percent manganese, at locations where beneficiation plants are in process of erection or where the reserves are such as possibly to justify such erection.

Defense Plant Corp. has made commitments of $6,565,000 for facilities to produce more than 125,000 tons of manganese concentrates per annum, as well as $675,000 for the production of ferromanganese.

Mercury

A price of $192.00 per flask f.o.b. New York, which will remain in effect until Dec. 31, 1943, has been established to encourage new and small producers of domestic mercury. Current purchases are being made in quantities as small as one flask.

Mica

A buying organization has been established with headquarters in North Carolina and in New Hampshire through which producers of mica will be enabled to dispose of material of strategic grades. Metals Reserve Co. plans to assist these producers in the production of mica and in its preparation for the market by financing their operations where necessary.

Molybdenum, Tantalum, and Tin

Defense Plant Corp. has authorized commitments of $360,000 for the production of molybdenum.

To increase annual capacity for the production of tantalum oxide and tantalum metal, Defense Plant Corp. has authorized the expenditure of $4,170,000.

When enlargements now in progress are completed, the tin smelter built by Defense Plant Corp. at a total cost of $6,300,000 to smelt Bolivian tin ore will have an annual capacity sufficient to refine all the tin ore available to the United States.

(*Continued on page* 114)

METALS FOR VICTORY

In the mining industry's drive for new records in production of critical metals, every aid to greater tonnage is vital.

Such recognized factors as the Edison Electric Cap Lamp's *dependable, more effective light* for the miner, and M.S.A. Skullgard's *proved protection* for his head, are helping effectively to assure that production goals will be reached . . . not only on time, but in greater safety every step of the way!

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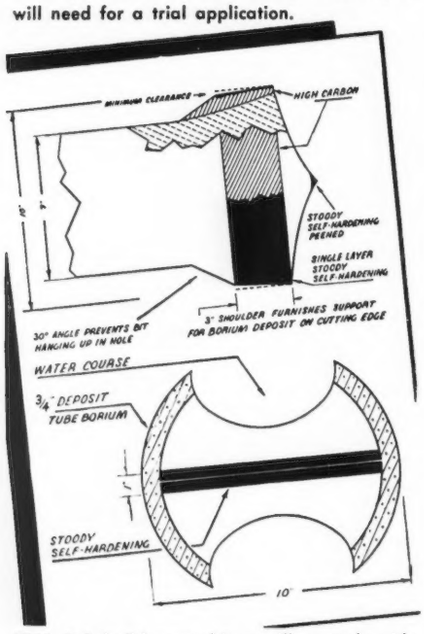
6 TIMES MORE
BLAST HOLE FOOTAGE
from *Hard Faced* Churn Drills

In a very hard formation an Arizona mine operator was able to drill only 10½ feet of hole with machine-dressed churn drills. By rebuilding and hard-facing his bits as explained below he was able to increase footage to 65 feet before the bit lost gauge. This is not an unusual record of service for a hard-faced bit. Reports we are receiving from field engineers indicate that similar results are being obtained both by quarry operators and petroleum companies.

If you are not obtaining satisfactory footage, perhaps the Stoody method of rebuilding and hard-facing churn drills will solve your problem. Tell us the size of your bit, and we will be glad to tell you how much hard-facing material you will need for a trial application.



STEP 1 Rebuild worn bit, as illustrated, with Stoody High Carbon to provide a support for the cutting edge.

STEP 2 Apply a single layer of Coated Stoody Self-Hardening over built-up area, bringing bit back to gauge.

STEP 3 Rebuild chisel of bit with Coated Stoody Self-Hardening, peening deposit to sharpen edge.

STEP 4 Apply 3/16 inch 20-30 mesh Acetylene Tube Borium to outer cutting edge.

IMPORTANT: To obtain the greatly increased churn drill life, Stoody Self-Hardening and Tube Borium deposits MUST BE PEENED while still red hot.

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Wide World

Canadian peat stockpiled at plant of Basic Magnesium, Inc., in Nevada

NEVADA

Soldier Miners Arrive in Small Numbers

Dayton dragline moving to Florida — Mercury flotation plant at Steamboat Springs — Bureau of Mines drilling at Goodsprings

▶ Small groups of soldiers, released from army duty on furlough to work in strategic metal mines, have arrived at Ely, Mountain City, and Copper Canyon, copper mining centers; at the Pioche lead-zinc-silver mines and at the Getchell mine, which produced gold, arsenic, and tungsten. From each group some men have been rejected and the total has not served appreciably to relieve the current labor shortage.

▶ A Class B development loan has been granted by the RFC to Hall Brothers, Inc., of Ely, for further opening of the Tybo lead-zinc mine, in Nye County, operated formerly with substantial production by the Treadwell Yukon Co., Ltd. The Hall company in late months has been shipping from the Tybo mine, trucking some 65 miles to the rail point at Tonopah, and has produced from the Hornsilver mine, in Utah.

▶ A new scheelite development of some promise is under way under the direction of Frank Margrave, of Reno, in southwestern Pershing County, in the Nightingale Range and near Winnemucca Lake, six miles north of the lately completed 100-ton tungsten mill of the M. G. L. Mining Co. Substantial widths are exposed, some of high grade.

▶ Operation of the old Groom lead-silver mine, in southwestern Lincoln County, with a new flotation mill, is being conducted by the I.M.C. Corp., operating subsidiary of the International Mining Corp., 630 Fifth Ave., New York, with Dan Sheehan, Caliente, Nev., superintendent. Shipments of 40 tons weekly of 60 percent lead concentrate have been trucked to Caliente, 90 miles, and the mill is to be enlarged. The mine has been a substantial producer of lead.

▶ Deposits of peat at Ash Meadows, southern Nye County and near the Death Valley highway, are to be worked on a large scale to meet growing demand for fertilizer and possibly for use in the Basic Magnesium, Inc., plant, which uses a large amount, imported from Canada. Tests are said to indicate a high quality for fertilizer, but it has not been shown that the material is suitable for use in the magnesium process. Las Vegas men announce plans to work the deposit with power shovels.

▶ RFC has advanced a development loan to the Grand Deposit Cons. Mines, Inc., with a gold-copper-zinc property in the Muncie Creek district of White Pine County. Paul C. Lyon, of Salt Lake City, is president. A Class C loan, limited to $5,000, has been granted by the RFC to the Old Central Mining Co., operating lead-zinc-silver property in the Central district, northern Pershing County. Raymond Brooks, with office at Winnemucca, is directing engineer.

▶ The long-idle and partly dismantled 60-stamp cyanide mill of the Tonopah Extension Mines, Inc., was destroyed by fire on Oct. 23, with the office building, warehouse, and several adjacent residences, including that of Homer L. Williams, general superintendent. Closed since early 1929, virtually all equipment of value had been sold.

▶ Reports state that the dragline dredge of the Dayton Dredging Co., largest in the United States of its type and last year the third largest gold-producing unit in Nevada, is to be dismantled at once and the dragline excavator, employing a 12-cu.yd. bucket, will be shipped to northern Florida for use in government canal construction. P. S. Crocker is manager at Dayton, where a large part of the town has been removed.

▶ Engineers of the U. S. Bureau of Mines are directing prospect drilling in the Goodsprings district, where lead and zinc carbonate ores, available in large volume, are to supply on a custom basis a plant at Jean, 5 miles from Goodsprings and on the Union Pacific railroad, for which the Defense Plant Corp. has allocated $341,000.

▶ In the Copper Basin area in Lander County the Central Eureka Mining Co., having closed down its gold mine and mill at Sutter Creek, Calif., has provided surface equipment at the Copper Queen mine and is conducting development work at other points in the copper-gold area near properties of the Copper Canyon Mining Co., now operated with a 350-ton flotation mill by the International Smelting & Refining Co.

▶ Development in what is known as the Greenan-Kerr tin property, including the old Majuba Hill mine, in Pershing County, continues to expose disseminated cassiterite with lenses and inclusions of high-grade tin ore. A block of ore weighing around 140 lb. and sampling nearly 50 percent tin was brought by James O. Greenan to the museum of the Mackay School of Mines. Ore broken and in sight is estimated to contain some 30 tons of metallic tin. George W. Kerr, also of Reno, is associated with engineer Greenan in the operation. A carload of copper ore was shipped recently to the A.S.&R. Garfield smelter.

▶ A 30-ton Gould-type rotary furnace has been installed at the Red Bird cinnabar mine, in the Relief district, Pershing County, by the Harold's Club Mining Co., of Reno, which has been producing mercury in substantial volume from a six-retort plant under direction of Ervin J. Young, managing engineer. The same company is reopening the old Last Chance lead-zinc mine in the Antelope district, Pershing County, and is developing scheelite claims 6 miles south of the Getchell mine in eastern Humboldt County. R. R. Wiedeman is superintendent.

▶ Production of manganese ore has been resumed by the Golconda Mining Co. from its leased Black Diablo mine, in Pumpernickel Valley, northern Pershing County, under direction of Hollis E. Chatwin, who in recent months, until halted by bad roads, has shipped ore at the rate of a carload daily to the plant of the Columbia Steel Co., a U. S. Steel subsidiary, at Ironton, Utah. Golconda is the rail point.

▶ A mill employing flotation and gravity concentration has been built by the Pelton-Swallow Engineering Co., of Los Angeles, at the Steamboat Springs cinnabar deposit south of Reno. The ore consists of a surficial deposit of siliceous sinter, loose and readily mined by power shovel. The deposit, on which numbers of plants have been operated without success since 1875, supplied a considerable amount of mercury in the late seventies for use in mills on the Comstock lode, employing the Washoe process of pan-amalgamation.

▶ Barite deposits acquired some time ago under option by the National Lead Co. for its National Pigment & Chemical division have been surveyed recently and surface work has been conducted under the direction of E. H. Murchison, who has been stationed at National Lead's large-scale barite operation near El Portal, Calif., at the entrance to Yosemite National Park. The two Nevada deposits are situated in northern Eureka County and eastern Humboldt, south of the Getchell mine.

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CALIFORNIA

Pacific Building New Chrome Concentrator

Three chrome operations — Harrison mercury mine to resume — Three new copper properties also active

▶ Operations are to start soon at the Harrison quicksilver mine, near Rumsey, Yolo County, optioned recently by H. C. Scott, of Oakland. The property is owned by Vincent and Vernon Harrison, of Morgan Valley, Lake County, and is equipped with a treatment plant. Mining is to be done by open-pit methods.

▶ Hoefling brothers, of Sacramento, have acquired a copper-zinc property in Butte County near their Surcease gold property, and development work to determine the worth of the mine is under way. If results prove favorable, mined ore will be treated at the Surcease mill, which will be remodeled to meet the new conditions. Allan E. Jones is general manager of all Hoefling Brothers' enterprises, including the Spud Patch Placer tungsten project operating at Atolia, Kern County.

▶ Marsman Co. of California, J. O. Enberg, president, of San Francisco, has leased the Dobbas chrome property, in the Rattlesnake district of El Dorado County, from James Dobbas, and active work is to commence soon. The company recently also acquired control of the holdings of Volo Mining Co. near Placerville, where a 100-ton milling plant formerly handling gold ore is now treating chrome ores from several neighboring chrome properties.

▶ Work has been started on chrome holdings in the Latrobe area of El Dorado County by Trio Chrome Co. Operations are directed by Richard Herzog.

▶ Development work is in progress at the copper property of Consolidated Gold & Metals Co. a short distance from the Walker mine, in Plumas County, and the company is negotiating for construction of a road to rail points either at Taylorsville or Crescent Mills to facilitate shipment of ore to the smelter. A substantial tonnage of ore has been blocked out and stored on dump. J. R. Walker, of Salt Lake City, is president of the company.

▶ The old Newton copper mine, in Amador County, has been reopened by J. H. Lester, who has recently acquired a lease and option, and active rehabilitation work is under way.

▶ Pacific Mining Co. is constructing a chrome concentrating plant in the Marsh Flat district of Tuolumne County, with operations scheduled to commence by Jan. 1, 1942. The company has optioned several properties in Tuolumne and other counties, and the new mill is expected to handle some 100 tons a day. P. R. Bradley, Jr., who also manages the company's Pine Tree and Josephine mines, in Mariposa County, and the Harvard mine, in Tuolumne County, directs operations.

ARIZONA

Copper Camps Get Soldier-Miners

Trailer-camp housing facilities for newcomers—Bagdad Copper near production stage—Mines rehabilitated in Cedar Valley, Stanley, and Summit districts

▶ A number of miners have been released from Army service and sent to the Globe-Miami, Morenci, and Bisbee districts, for work in essential mines. Most of these men are coal miners, with little or no hard-rock experience; nevertheless, they are welcomely received, as the important copper mines of these districts have been seriously handicapped for lack of labor. Because of a shortage of housing to accommodate these newcomers, Capt. I. F. Long of the Army Service of Supply, and Edgar Bissantz, of the U. S. Housing Authority, have hastily provided for trailer camps—300 trailer houses for Miami, 200 for Morenci, and 200 for Bisbee. While working, the soldier-miners will be restored to civilian status and self-support. They are privileged to quit their jobs if dissatisfied, but if they leave mining work they will be compelled to return to military service.

▶ According to E. R. Cullity, manager of the mining division of the Southwestern Engineering Co., the Bagdad Copper Corp., at Hillside, is scheduled to get into full-scale production in the middle of December, when the 70-mile power line from Parker dam is completed.

▶ The mine, at present producing 200 tons of ore per day, has been prepared to operate on a 2,500 ton scale under the direction of J. W. Still, general manager. A new shaft has been sunk 500 ft., the main haulageway on that level completed, and new stope sections have been opened for block caving.

▶ The new 2,500-ton copper and molybdenum flotation plant was designed and is being constructed by the Southwestern Engineering Company, Los Angeles. Other installations nearing completion are the new 125-ft. steel headframe, hoist, and a four mile tailing-disposal line to a site on Boulder Creek, where the tailings will be impounded. Water will be pumped 8 miles through a 10-in. pipe line from Burro Creek to the mine for milling and domestic use. The pipe line is being installed by W. J. Henson, Prescott, Arizona, contractor. Construction of the new mill and mine surface installations is under the direction of C. Q. Schlereth, vice president of the Bagdad Copper Corp., of which S. A. Millikin, of Cleveland, is president.

▶ Pursuant to the granting of an RFC loan, C. L. Friederichs, of Dewey, has started rehabilitation of the Starlight mine, in the Stanley district, Graham County. The property is already extensively developed, with a 1900-ft. tunnel and several drifts.

▶ J. S. Coupal, director of the State Department of Mineral Resources, has announced completion of a survey of Arizona fluxing ores for the WPB.

▶ The Copperville and Leviathan mines, 25 miles southeast of Yucca in the Cedar Valley district, have been acquired by Mines Development, Inc., headed by M. B. Dudley. Both properties are now being rehabilitated and developed for early production. At the Copperville property, where a flotation concentrator will be erected, dewatering was expected to be completed about the first of December and sampling done on a large orebody on the 200 level. The mine is estimated to contain 300,000 tons of lead-zinc-silver ore, about half of which is above the 200 level and the remainder between the 200 and 400 levels. The Leviathan, owned by Leviathan Metals Co., of Duluth, Minn., was a molybdenum producer during the first World War. The shaft will be retimbered and a modern mill built.

▶ The Kuno Mines Co., headed by Louis Kuehne, of Globe, has reopened the Kuno mines, in the Summit district, Gila County, since being granted an RFC development loan. The property contains a number of veins of high-grade copper ore as well as a large low-grade orebody. Present development consists of several adits.

COLORADO

Climax Is Awarded Army-Navy "E"

Construction started on 100 ton concentrator at Leadville—Golden Cycle mill may be used for base metals—Smelter Corp. will mine placer scheelite near Randsburg

▶ H. B. Mars reports that he located several claims after spending the summer prospecting for vanadium on Squaw Creek, in the western part of Montezuma County. Following a winter's rest in McElmo Canyon he will return to Squaw Creek and continue mining operations. He states there is a large amount of high-grade ore to be found on Squaw Creek; also that W. W. Sparks, of Cortez, is doing extensive mining work and has some 600 tons of ore ready to be transported to a milling plant. He has worked the rims for a distance of more than 1½ miles. Sparks has also staked claims on Cross Canyon.

▶ Alf Haines states that his El Paso claim at the head of Goose Creek, near Gunnison, has a fine showing of lead ore: that the deposit is in the form of a "blowout"—that is, a place where there is no distinct vein. The quartzite which comes in the ore carries values in gold, which often average one ounce per ton. Dick LaMoy has accompanied Mr. Haines to the mine, that they might clean it up preparatory for government inspection.

▶ Twenty tons of ore daily are being shipped to the Sunnyside mill from the Pueblo Belle tungsten mine, near Boulder. W. E. Gilson operates the mill and the Shattuck Chemical Co., of Denver, operates the Pueblo Belle and adjoining claims. Ernest Peterson, of Boulder, is mine superintendent.

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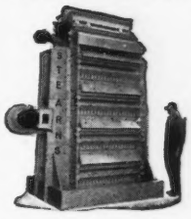

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Photo by Barbre

Walking dragline and washer of Cooley Bros. on Tarryall Creek, Como., Colorado

▶COLORADO

▶The greatest molybdenum mine in the world, at Climax has been awarded the Army-Navy "E". The following data show the progress that Climax Molybdenum Co. has made:

Year	Tons of Ore Mined and Milled
1934	1,275,356
1935	1,267,459
1936	1,494,926
1937	3,462,634
1938	4,344,734
1939	3,430,952

The mine, crushing plant concentrator, and drying and packing plants are fully equipped to handle 15,000-tons of ore per day.

▶Edward S. Goodwin, president of the Utze Lode Co., holding the Tolland County tunnel group of claims on Ute Creek, states they are being put into operating condition. A few years ago it was found that the presence of lead and zinc made operations unprofitable but now the company can operate these same claims profitably. The company has taken a lease on the Silver Spruce mill, in Idaho Springs, and will convert it to selective flotation to save the zinc and lead.

▶The Ben Harrison shaft, in the Trail Creek district near Idaho Springs, has been retimbered to a depth of 280 ft. A headframe and shaft house have been built and a compressor and hoist installed. When production is started, the ore will be shipped either to the Milliken mill or the Golden Cycle mill. George Calloway, R. M. Calvert and John and Jack Mollard are the operators of this and the adjoining Croesus mine.

▶Thomas and Kenneth Walsh, at Nederlands, have put on a third shift at the Cowdery mine and the Manchester property. A body of rich ore has been opened at the Cowdery mine, which is being developed by drifting and crosscutting. They have enlarged the pond on Beaver Creek and are unwatering the Manchester mine.

▶Construction work on the new 1,000-ton sink-float concentrating mill at Leadville has been started and will be pushed on this plant so that dump ores from the several mines in this district can be treated. Roy A. Wicker, Denver manager of the Western Machinery Co. and the Western Knapp Engineering Co., states that the mill will cost more than $300,000, and is being built for the Ore & Chemical Co. Considerable testing work has been done on these Leadville mine dump ores, so that economic treatment can be made. At least 1,000,000 tons of dump ores are now available for concentration in this mill and a large additional tonnage of ores from other dumps, yet untested, should be made available before the winter is over. It is hoped that the building of this new mill will add impetus to some project whereby the Leadville section can be drained and millions of tons of complex sulphide ores made available for treatment. Karl Spohr, research chemist for the Ore & Chemical Co., has been doing the metallurgical work. Mr. Utt will be in charge of construction work at Leadville, and Edward Dickerman is construction engineer.

▶R. L. Landis and J. Ben Ross have leased the Paymaster-Red Rose manganese property, at Gunnison, and are busy cleaning up and getting the property into operating condition. Men and equipment have been moved from Cripple Creek to the Paymaster, on Steuben Creek, 8 miles west of Gunnison. They are contemplating the installation of a mill and diesel power and building of surface structures, new roads, and deadwork underground. This property was worked in 1940 by Keane and Walsh.

▶The Marmac Mining Co., headed by Edward F. McNees has opened the Little Nation mine at Howardsville. This mine, with zinc-lead-copper ores, is equipped with a 100-ton mill, and is producing 60 tons daily.

▶The Hawkeye mine, at Monarch, reopened recently, and Sid Burleson expects to mine zinc-lead-silver ores.

▶The War Production Board's order to shut down some gold mines in the United States will allow some small mines and leases to operate, but the major mines in the Cripple Creek district, Alma-Fairplay, and other sections producing mainly gold and silver will be forced to close as a result of this ruling. A. H. Bebee stated that many of the men in the district were too old to migrate to other mines; that they could not pass the physical examinations required in the copper mines; and, as many of the men lease the several properties, and work only as they wish, they will not leave the Cripple Creek district. Merrill Shoup stated that the Golden Cycle company would conduct a survey of zinc possibilities in Colorado, that zinc ore might be treated at the mill at Colorado Springs; and that the corporation would seek contracts for the machine shops at the various mines. He further added that the financial resources of the Golden Cycle Corp. will be used to keep Cripple Creek alive. This is the first time in the history of Cripple Creek that the mines have been forced to shut down.

▶The Ouray district is staging a comeback, in the development of both old and new properties, all caused by the war impetus. RFC loans, together with some new capital, have made this possible. Only the scarcity of labor is delaying this revival. The Denver Equipment Co.'s San Antone mine, served by the Koeler tunnel, and the famous old Revenue, recently taken over by William Cutler and L. K. Requa under lease and option, have started operations. Both of these properties are said to have good possibilities for the production of strategic metals. The Koeler tunnel is being put in working condition. At the Revenue, rehabilitation work is well under way. E. W. Creel and associates, operating the Mickey Breen, have been working for months. Ralph Wright has been developing the Colorado Sunrise where a 40-ft. vein of copper, zinc, and lead with some silver has been exposed. Machinery has been brought to the spot and the electric line is now being installed. The tram from the old Brooklyn mill has been installed at this property. Mountain Top mine has been opened by Sam Fellin and Andrew Suytak, who shipped 16 tons of ore that returned over $3,000. This property will be developed next summer. The old Syracuse and the Mountain Kind dumps are being run through the mill with satisfactory results.

▶The Lucky Strike mine, at Kokomo, is now producing a rich zinc-lead ore. Here a blanket vein has been opened for 240 ft. which is reported to be 9 ft. wide. Private capital opened this rich mine.

▶The first carload of manganese ore has been shipped from the Wilson Manganese Co. mine, on Spring Creek, 14 miles from Almont. Tom Pederson, superintendent, expects to ship regularly this winter. A contract for driving a 400-ft. tunnel has been let and work started. The tunnel is expected to make increased tonnage possible. Present regular production is high-grade manganese coming from original workings.

▶Louis Gold is installing mining machinery at the Bearcat Mining Co. in the Tarryall district near Fairplay, and expects to be producing strategic metals soon.

▶Hayden Mining Co. is operating a mining property in the Tomichi district, and Ralph E. Ruder, president, states the company has purchased four mining claims in the Elk Mountain district and twelve claims in the Tomichi district.

▶Operations to meet winter conditions are being pushed at the Sally Barbara, Bon Ton, Country Boy, and Monte Cristo mines, in the Breckenridge district. Miners are badly needed, and C. L. Colburn, of the Country Boy mine of the Garvie-London Co., has made arrangements for some 25 or more men, along with a number of men from the Blue River Dredge.

▶A 2½-cu.yd. dragline, oil tanks, lumber for buildings, and miscellaneous equipment have been installed on the Molybdenum Corp. ground south of the Stringer district, near Randsburg, by the Smelters Corp., of Lodi, Calif. Grant Morton, engineer in charge, stated that further shipments of a dry concentrate and equipment for the clean-up house will follow immediately. He further stated that Smelters Corp. is a Lodi group headed by W. B. Thurman, and that decision to place equipment in this field followed a long period of exploration work by representatives of the company. The objective is to concentrate scheelite from the placer ground by dry process and to finish the recovery with water. The equipment is to have a capacity of 1000-cu.yd. daily.

▶L. B. Stitzer, superintendent, has a force of men clearing up the tunnel, winze and stopes at the Akron tunnel, at Whitepine, preparatory to shipping zinc-lead ore from underground workings of the famous old North Star and May-Mazeppa mines. Buildings are being made ready so that a large force can work during the winter months.

▶Stockholders of the Ute Creek Syndicate, Inc., held a meeting and decided to liquidate. The directors were instructed to sell all assets, pay the debts, dissolve the corporation, and permit any stockholder or officer to purchase or participate in the purchase. It was proposed to the stockholders that each of them desiring to participate should put up 20c per share for each share of the Ute Creek stock now held by them, this money to be placed with a new small company to be formed to be known as the Raymond Mining Co., which will use the money to purchase the assets and hold them until mining can be resumed. G. W. Gunderson is president and Harry S. Silverstein is secretary.

▶The Defense Plant Corp. of the government has paid over $110,000 for the Urad molybdenum property, high on the east side of Red Mountain, 10 miles west of Empire, and is now ready to carry on development work throughout the winter without interruptions.

▶Josiah H. Holland, general manager of the Pride of the West, Inc., has resumed operations at its Green Mountain mine, near Silverton.

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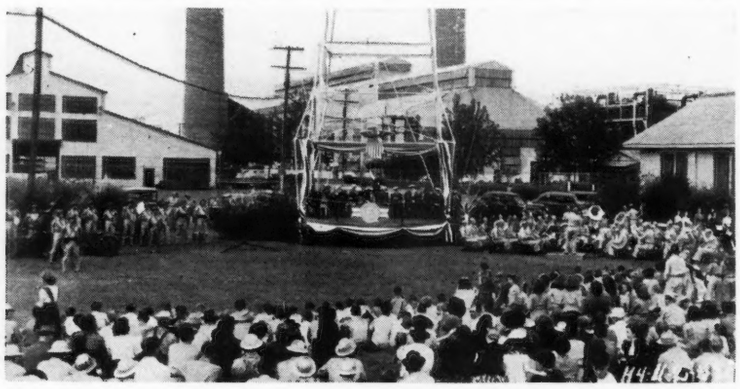


Awarding Army-Navy "E" to Texas Gulf Sulphur Co., Newgulf, Texas

SOUTH DAKOTA

General Electric Seeking New Beryllium Sources

Mine inspector criticizes high severance tax—International to produce Chamberlain nodules—Holy Terror mine down for duration

▶A search for additional sources of beryllium, critical war material, has been launched in the Black Hills of South Dakota by a research council composed of South Dakota School of Mines professors and financed by the General Electric Co. at the request of the War Production Board.

▶Production of 300,000 tons of manganese nodules annually is the goal of a $800,000 development program which is to start immediately in the Chamberlain low-grade field, according to United States Representative Francis Case, of South Dakota. The International Minerals & Chemical Corp. will construct and operate the plant. The corporation, according to Louis Ware, president, has signed a contract with the governmentally owned Metals Reserve Co., which holds a royalty contract with the General Manganese Corp., lessee of the extensive manganese lands. The South Dakota ore, which averages about 16 percent, will be combined with concentrates containing as much as 60 percent manganese from Montana and Minnesota to produce the 48 percent concentration used in steel making, according to the WPB announcement.

Plans call for the mining of about five million tons of South Dakota ore a year, which will necessitate the moving of approximately 20,000,000 tons of earth. The nodular manganese field in South Dakota, according to recent surveys by the South Dakota geological survey and the U. S. Bureau of Mines, constitutes the largest ore reserves in the country. Development in the past has been consistently blocked by the high processing costs of the low-grade ore.

Construction of the new plant follows several months of experimental work on the ore at a pilot plant near Chamberlain and at processing plants at Salt Lake City, Utah; Boulder, Col., and Knoxville, Tenn. Tentative plans call for the transportation of the manganese ores from South Dakota on the Missouri River by barge to St. Louis or other southeasterly points for blending with higher-grade ore. The presence of low-grade manganese in the Chamberlain area was first discovered in 1927 during an investigation of proposed hydroelectric sites on the Missouri River.

▶Mining operations of the Holy Terror Gold Mining Co., of Keystone, were discontinued in September because of a manpower shortage, George Flavin, secretary-treasurer of the company, announced. The company's properties—the Holy Terror and the adjacent Keystone which were developed in the early 1890s, closed in 1902, and reopened in 1939—have produced in excess of $300,000 during the last two years, Flavin said. Pumps in the mine, which during the early days of the Black Hills produced fabulously rich ore, have been pulled and water is again filling the shaft and drifts. Flavin said the company plans to reopen after the war. The mine was one of the four operating gold properties in the Black Hills this year.

▶South Dakota's 6 percent ore tax, which yielded about $1,200,000 in revenue to the State government last year, was called "highly discriminatory" by H. H. Stewart, State Mine Inspector, in his annual report. The report, prepared before the gold mines of the nation were ordered closed by the WPB, said that the tax, imposed on any mining operation producing more than 100,000 tons of ore a year, "is by its very nature highly discriminatory and wastes the natural resources of the State and nation by throwing marginal ores into the nonprofit bracket, thereby losing them forever. When such ores are eliminated, in many instances, underground conditions preclude their eventual recovery under more favorable economic conditions. A critical analysis of the problems of the mining industry," Mr. Stewart added, "inevitably leads to the conclusion that it would be to the best interests of this State to adopt a more moderate system of taxation, which over a period of years would not only increase the revenue which the State will realize under the present ore tax system, but would also invite outside capital to develop the resources of the State."

New Bentonite Production In North Dakota

PRODUCTION of bentonite in the Little Badlands area of North Dakota, west of Dickinson, by the United Lignite Coal & By-Products Corp. of Mandan, N. D. will start soon.

A plant with a capacity of 200 tons a day is now ready for operation, according to William B. Forsyth, Jr., president of the newly formed company.

The North Dakota deposit, Mr. Forsyth said, is one of the most highly colloidal bentonites in the United States. The company plans to increase its production to 800 tons a day as soon as possible. About 100 persons will be employed at the beginning of production.

The firm was incorporated with a capital stock of $200,000 with William B. Forsyth, Jr., Detroit, Mich., Philip W. Blank, of Mandan, N. D., and George F. Blank, of New Salem, N. D., as incorporators.

This will be North Dakota's first bentonite production. South Dakota has been producing bentonite for several years and ranked second among the states last year.

Homestake to Develop Vanadium Deposit

THE Wyodak Coal and Manufacturing Co., a subsidiary of the Homestake Mining Co., of Lead, S. D., will develop a vanadium prospect in western Wyoming near Montpelier, Idaho, this winter.

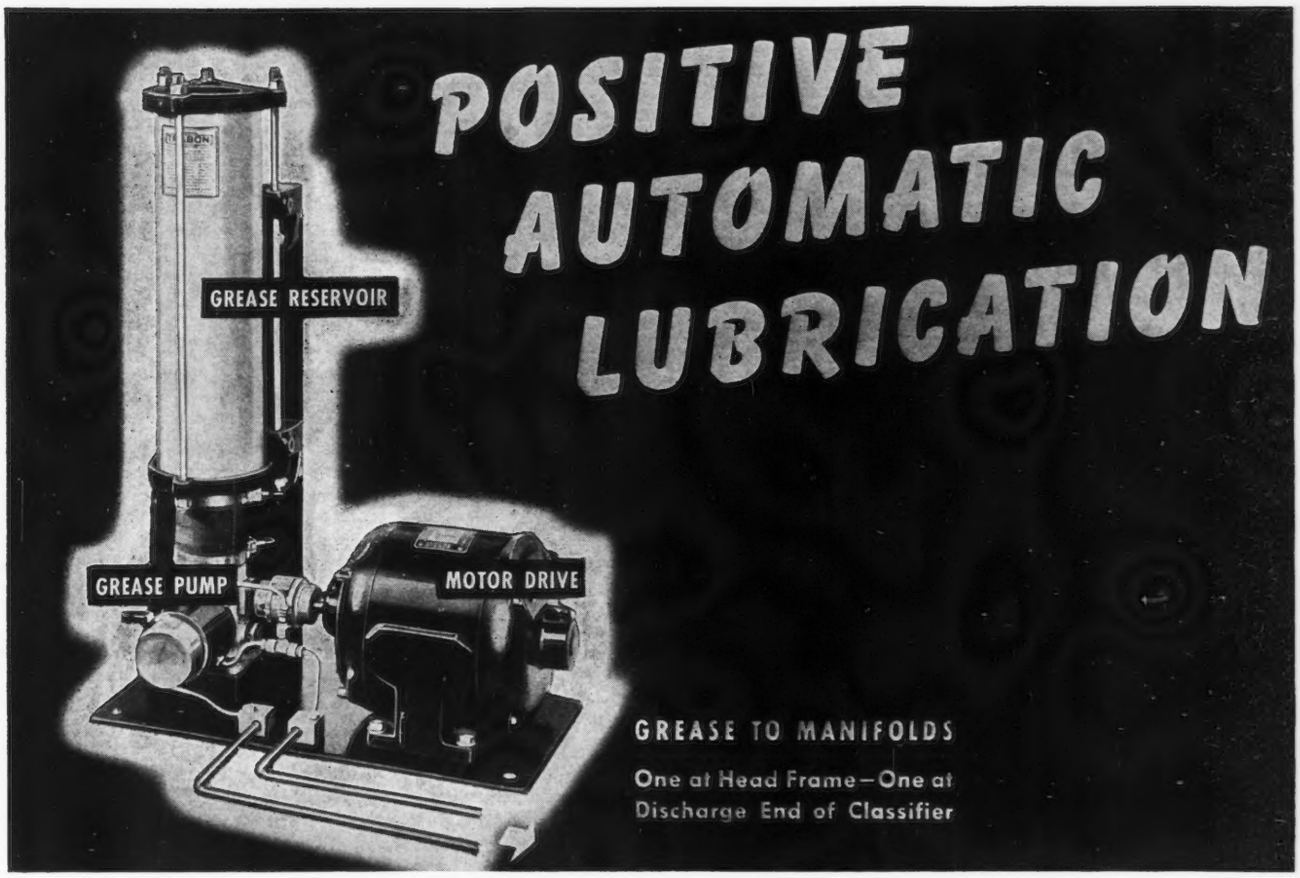
The first contingent of miners has arrived at the site to begin trenching and other surface exploratory work.

The deposit was discovered last summer by the U. S. Geological Survey, and for the last month a party of Homestake geologists and engineers has been on the ground making detailed maps and preliminary studies. The Homestake was requested to carry out the exploratory development and mining of the vanadium ores by the Metals Reserve Co. Plans for establishing a permanent camp at the property are under way and temporary headquarters have been set up at Montpelier.

All operations will be carried out in the name of the Homestake subsidiary, the Wyodak Coal & Manufacturing Co., which operates the company's Wyoming coal deposits. The new operation will be known as the "Sublette division."

Survey Is Examining Beryllium Deposit

ACCORDING to the Associated Press, the U. S. Geological Survey is examining a deposit of beryllium-bearing rock at Iron Mountain, 10 miles north of Winston, N. M. The find is characterized as still in the prospect stage, the beryllium-bearing rock being irregular and poorly exposed. The material is fine grained and of low grade, so that fine grinding and concentration will be necessary if an orebody of sufficient size is outlined to warrant development.



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ALASKA

Independence Mine Is Placed on Trial

Cleary Hills and U. S. Smelting to handle scheelite — Gold miners find work in critical mineral production—List producers holding serial numbers

▶ Pacific Alaska Consolidated Mining Co.'s Independence mine is the only gold producer in the Willow Creek area which did not close down with the WPB order directing such companies to cease operations Oct. 15. The Independence was told it might continue until Dec. 8 because its product contained scheelite. Whether the content of this war mineral is sufficient to justify a continuance of operation will be determined later. This order closed the Lucky Shot, Fern, and Gold Chord in that district and released more than 100 men. These mines are near Palmer and Wasilla, about 50 miles from Anchorage. T. S. McDougall, manager of the Fern, came down to Seattle. Walter Stoll, in charge of the Independence, is still at that property.

▶ Scheelite and ferberite, tungsten minerals, are being produced from some of the properties in the Mayo district. The production is a byproduct in placer gold operations. The producers are paid 75 percent of the assayed values as the product comes out. Two hundred tons of this ore is expected from these operations. Fred Taylor is producing scheelite in Dublin Gulch, and this mineral also is coming from the placer mining on Highet Creek.

▶ Mike Stepovich, a pioneer of the northland, has turned over to other producers two strategic metal properties which he has 18 to 20 miles from Fairbanks. He has assigned his scheelite property to Cleary Hills Mining Co., which is operating a gold property on Cleary Hill, near Fairbanks. The company will enlarge its mill to a capacity of not less than 100 tons a day. His other property he has leased for 50 years on a royalty basis to U. S. Smelting, Refining & Mining Co., the largest operators in Alaska. The placer ground which he has leased is 7 miles long, and Stepovich says it will pay practically the entire distance. He has stripped much of it with hydraulics and bulldozers and worked some of it with a dragline. Louis D. Colbert has a scheelite property adjoining that of Stepovich, and hopes to get it into production soon.

▶ Ken Johnston, of Anchorage, and associates of Fairbanks, are planning to develop on a larger scale the DeCourcey Mountain mercury mine, which they have been working on a small scale. They stripped the veins last summer and procured 38 flasks of mercury, which they crushed by hand and processed in an old retort. They have asked the RFC for a $20,000 loan for the purchase of a new retort to speed production. They will add hard-rock mining equipment this winter and next summer will start tunneling. They stripped 4 ft. of overburden to expose the veins.

▶ It is not expected there will be any unemployment in Alaska as a result of the order closing the gold mines. The men are finding plenty to do. United States Smelting, Refining & Mining Co. is putting two of its largest mess houses into quarters for road-building crews.

▶ Employees on construction for the Alaska road commission are said to have made a rich placer strike near Kimball Pass. Pans are said to carry 20 to 50¢. Some of the men have quit their jobs to go to mining.

▶ The Cliff mine, in the Valdez district, has closed because of a shortage of drill parts and other supplies and the difficulty in securing labor. Superintendent L. E. Tuthill has offered machinery and supplies for sale.

▶ B. D. Stewart, Territorial Commissioner of Mines, reports that every encouragement is being given to the production of strategic minerals and coal. Metals Reserve Co. has purchased and stockpiled some antimony ore and concentrates and some tungsten, mercury, and tin. Metals Reserve is eager to encourage small operators, Mr. Stewart reports. Art Glover is Territorial assayer.

▶ Charles Harper reports that not many gold mines operated this season in the Talkeetna district, because of the labor shortage. Some of them closed before the WPB order was put in force Oct. 15. Mr. Harper kept the Alaska Syndicate property going, on Thunder Creek. Others who operated were Joe Krumanacher, on Cheechaco Gulch; Adolph Traska, on Cache Creek; Miles Prometer, on Falls Creek; Matt Hamberg, on Dollar Creek; H. Reeves, on Upper Cache Creek, and Kirkland Olson, on Lower Peters Creek. Norman C. Stines spent the season prospecting on Bird Creek and its branches and claims to have made valuable discoveries.

▶ Lee Howard has received a government loan and will reopen the Salt Chuck mine, 40 miles west of Ketchikan, where he expects to produce palladium and copper and some gold.

▶ E. L. Bartlett, Secretary of Alaska, reports that the following 15 mines in the Territory hold P-56 serial numbers from the WPB and are excepted from the order closing all gold mines: Alaska Juneau, lead and chrome; Alaska Gold and Metal Co., Salt Creek mine, Ketchikan, palladium and copper; Chrome Queen Mining Co., Seldovia, chrome; Clara Creek Co., Anchorage, platinum mine in Goodnews Bay; Kuiu Zinc Mines, Juneau, zinc; Robert F. Lyman, Crooked Creek, mercury; Lynch Bros., Seattle, Yakobi Island, nickel, and on Kenai Peninsula, chrome; Nelkin and Halverson, Slietmut, quicksilver; Red Mountain Co., Seldovia, chromite; J. H. Scott Co., Hyder, tungsten; Howard C. Sparks, Fairbanks, antimony; Cleary Hill Mines Co., Fairbanks, tungsten; Goodnews Bay Mining Co., platinum; Heath and Miller, Seldovia, chrome.

▶ A. A. Shonbeck, operating the Gaines Creek Mining Co., at Ophir, reports a successful season, with 12 men employed. He has closed the mine after keeping it in operation since April.

IDAHO

400 Soldier-Miners Boost Labor Supply

Sunshine reports decreased production—Star mine adopts scraper-loading—Morning mine goes to double-shift operation

▶ In an effort to relieve the labor shortage in the Coeur d' Alene mines, the government has shipped in 400 soldiers from Camp McCoy, Wis., and Fort Douglas, Utah. The men are released on a 90-day contract furlough. Most of the soldiers are coal miners from West Virginia and Tennessee. If the plan works it is understood a total of 4,000 men will be released from camps to work in the mines of the Western states.

▶ Sunshine Mining Co.'s third quarterly report for 1942 shows net smelter returns of $691,272.10, against $980,566.37 in the second quarter and $1,062,304.04 in the first quarter. "The production in ounces of silver decreased 29 percent from the second quarter of this year," general manager R. D. Leisk reports. "This decrease," he explained, "can be attributed almost entirely to the labor shortage in this and other non-ferrous metal-mining districts. The tonnage milled in the third quarter was 50,370 tons, as against 68,830 tons in the second quarter and 79,920 tons in the first quarter this year."

▶ Government engineers are starting mining work in Bear Lake County, near Montpelier, for the development of vanadium ores. Forest H. Majors is chief engineer of the project, which is being sponsored by the U. S. Bureau of Mines. H. R. Lanterman, of Pendleton, Ore., is superintendent of operations and is now building a camp in Raymond Canyon, where the largest operation will be conducted.

▶ Butte-Highlands Mining Co., former operators of a gold-copper mine near Butte, and the Aurora Mining Co., of the Coeur d' Alenes, have agreed to pool resources in the development of the Aurora property, north of Wallace. A shaft is to be sunk 500 ft. below present tunnel workings where the vein has been followed for 2,000 ft. Electric power will be taken to the property by the Washington Water Power Co.

▶ Federal Mining & Smelting Co. has added a second shift in its Morning mine, at Mullan. The crew is not yet complete, the management stated, but will be increased as rapidly as men are available. Labor shortage forced the mine to one shift underground for the past several months. The property under normal conditions employs about 600 miners.

▶ Clayton Silver Mines Co., operating its mine at Clayton, in eastern Idaho, has elected W. M. Yeamans, of Yakima, Wash., as president, succeeding the late Herman Marquardt. Judge A. H. Featherstone was named vice president. The company is making regular shipments of lead and zinc ores.

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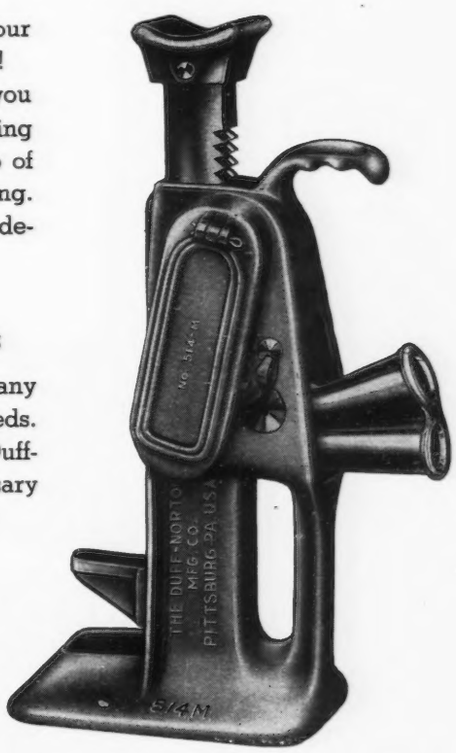

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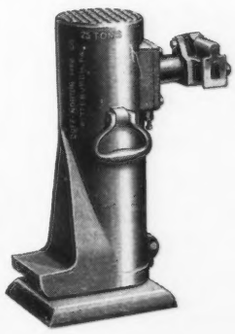

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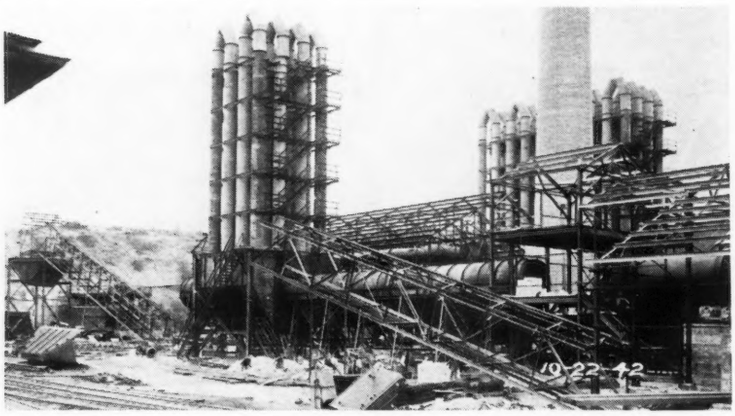


Million-dollar slag-fuming plant under construction by Bunker Hill & Sullivan in Idaho

▶IDAHO

▶Dixie Queen Mining Co., which has been operating the Blue Bird property, in the Little Smoky district of Camas County, near Fairfield, Idaho, is reported to have suspended operations.

▶Sullivan Mining Co., operating the Star mine, at Burke, in the Coeur d' Alenes, has introduced the scraper muck-loading system in the underground workings and now has eight scraper loaders at work. The scrapers are operated by little tugger hoists and operate on the same principle as a dragline scraper. A double drum on the little tugger hoist solved the problem and made the system practical. One drum drags the scraper loader to the point of loading; the other drum drags the scraper back to the source of supply.

▶John Glass and associates, of Huntington, Oregon, have purchased the Silver Still property on the Idaho side of the Snake River near Huntington. Glass also operates the Egan property, in Washington County, Idaho.

▶The Golconda mill, near Wallace, is milling 1,000 tons of ore for the Lucky Friday mine, located near Mullan. The ore is of the same character as that which produced $16,000 last month in lead-silver and zinc. The shaft at the mine is to be lowered to the 700-ft. level. Present ore shipments are from the 500 level.

▶The Sidney mine, on Pine Creek, near Kellogg, will send 500 tons of mill feed to the Little Pittsburgh mill this month, according to Manager Williamson Beaudry. Plans are under way for erection of a mill at the Sidney as soon as equipment can be found.

▶The Linfor Copper mine, 15 miles west of Kellogg, is to be reopened by George Austin, of Spokane. A government loan will be available to help get the ore to market. The mine, a former copper producer, has been idle for the past 20 years.

▶The Hope silver-lead mine, at Clark Fork, in Bonner County, is making a carload shipment of lead-zinc concentrates every other week, manager Albert Nash reports. The mill is operating one shift, and two shifts are employed in the mine. Twenty-four men are employed. If more were available production would be stepped up, manager Nash announced.

OREGON

Vanadium Discovered in Curry County

New handbook of Josephine County mines —Humphreys Gold Corp. enlarges chrome holdings—Developments in Mormon Basin and Hells Canyon

▶A new handbook of the 335 metal mines in Josephine County has been prepared by the State Department of Geology. It was prepared by Earl K. Nixon, director, and by Ray C. Treasher, in charge of the state's field office and assay laboratory at Grants Pass. This handbook is one of a series that is expected eventually to include all known mining properties in the State.

▶Wilbur Reed, of Burlington, Iowa, and Mrs. J. V. Randall, of Baker, head a group which has been sinking a 100-ft. two-compartment shaft on the Randall property in the Mormon Basin district, near Huntington. The ground includes the Golden West mine.

▶The State Department of Geology and Minerals reports the discovery of an ore deposit containing vanadium in the center of Curry County, in the Coast Ranges, in the southwestern part of the State. A spectrograph was used to detect the valuable ore. Samples examined show in excess of 1 percent vanadium oxide. The department has mapped and sampled the immediate vicinity of the discovery. Estimates of more than 300,000 tons of ore have been made. The deposit is an old sandstone bed containing magnetite or magnetic iron oxide.

▶Claims carrying copper, gold, and silver, on the Oregon side of Hells Canyon of the Snake River, located by A. P. Carnahan, of Homestead, are being developed by Salt Lake City interests, headed by C. B. Spencer. The claims contain dikes thought to be extensions of the well-known Red Ledge dike, across the river in Idaho. The operators plan an aërial tramway down the mountain and across the river to a shipping terminal on the Idaho side.

WASHINGTON

Active Development in Stevens County

Large shipment of silver busbars received — State college to train light-metals technicians — Howe Sound maintains high production rate

▶Washington State College, at Pullman, through Prof. G. Everett Thornton, of the engineering department, has made application for federal funds to institute a program in Spokane for training light-metals technicians. The funds are expected to come from a congressional appropriation. Glenn Jones, director of college extension work at the school, has been making arrangements in Spokane for the course. He reports that the Spokane section of the American Society for Metals is backing the course and that the Spokane State Employment Service office will cooperate.

▶Howe Sound Co., at the Holden copper mine, in the Cascades, is operating 13 days out of each 14. The mill handles 2,250 tons of ore a day and the concentrates are shipped to the Tacoma smelter. The copper production is 25 tons daily.

▶L. W. Davenport has an office at Colville, where he is receiving applications for work from farmers who have completed their season's runs. He has orders for miners, muckers, machine men, trammers, and drillers for several mines in Stevens, Ferry, and Pend Oreille counties. He represents the U. S. Employment Service. The non-ferrous mines are under war manpower freezing orders, but he says farmers who enter this work can receive conditional releases to do their spring farm work.

▶Russell Parker, who has a lease on the Bonanza mine, in Stevens County, and has secured a government loan, is said to have already taken out enough ore to meet the total of the government loan. Like other mines in the district, it is a silver-lead producer.

▶George Wagner, manager, says West King Mining Co., working the old Orazada mine, reports that the main lead on the lower 300-ft. level has been struck 1,200 ft. from the portal and that the vein is 12 ft. wide. The ore is said to run 14 percent lead, 5 percent antimony, and 37 oz. of silver to the ton. Power equipment is being installed and the company plans to put in a mill.

▶Fred R. Jameison and Ellen Burns have taken a four-year lease and option on the Iroquois mine, in northern Stevens County. It is owned by the Dr. R. S. Wells estate and Magnus Wulf, of Northport. Ore samples are said to run as high as 74 percent lead, with

some zinc and silver. Mr. Jameison reports that supplies have been laid in for winter development and that two crosscuts will be driven at the north end of the property to tap the vein opened by a shaft.

▶ Lee B. Carroll, manager, reports that operations are ready to start at the Kaaba-Texas property, in northern Stevens County. The 200-ton concentrator has been renovated and a 675-ft. air compressor, two transformers, two 100-hp. motors, a conditioner, and a filter have been installed. Seattle people are interested in this enterprise. The property is 13 miles west of Oroville, on the Great Northern Railroad.

▶ Geologists of the Chicago, Milwaukee & St. Paul Railroad have examined the tungsten mine of the Magma Mines Co., west of Ione, Pend Oreille County. Residents of Ione are among the owners.

▶ G. S. Ackerlund, of Spokane, reports he has 240 acres of land on a mountain of hematite ore, 6 miles from Usk on the east side of the Pend Oreille River. He says it carries copper, running as high as 28 percent, and silver and gold.

▶ Nine million dollars' worth of silver busbars reached Spokane last month for the aluminum reduction plant 9 miles north of Spokane. The shipment, heavily guarded, came in seven freight cars. Electric current for the two units of this plant already is being consumed, handled through busbars of copper. The silver bars will serve the four additional reduction units, nearing completion. Whether the silver came from the government storage at West Point, or from one of the subtreasuries, is not known. Installation will be made by the Aluminum Company of America, which is operating the plant for the Defense Plant Corp., its owner. Additional busbars of silver will be sent to the magnesium reduction plant in the same vicinity.

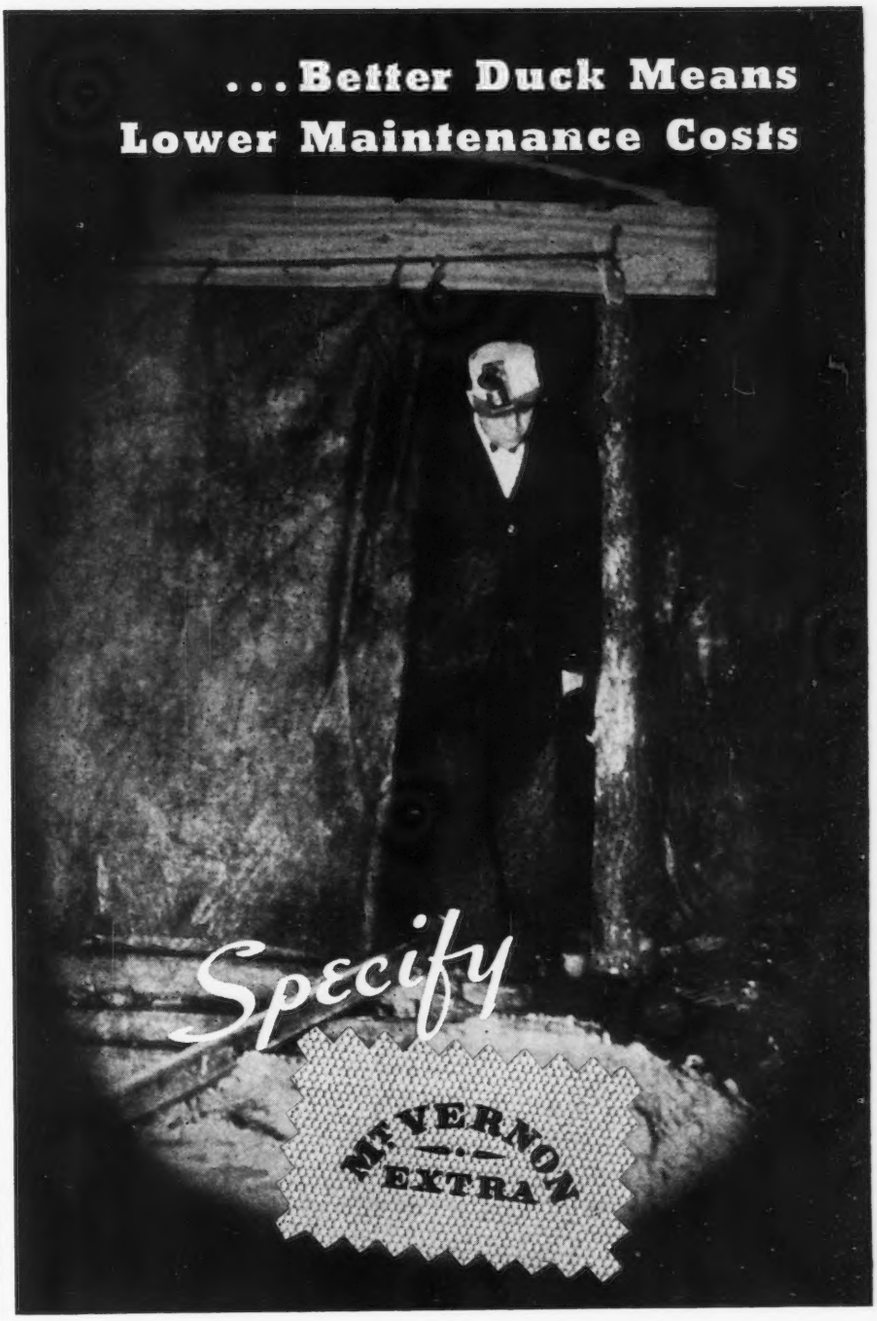
Wyoming Manganese Under Development

WYOMING'S recently discovered manganese field, 9 miles from Sundance, has assumed new potentialities with the announcement that three new operations will be started in the Bear Lodge Mountains area.

Armstrong & Babcock of Pasadena, Calif., last week acquired eleven manganese claims from Edward Peterson and will start mining as soon as machinery can be assembled. W. A. Fritz, of Billings, Mont., also announced he will start work in the same area within a few days. Fred Peterson, of Billings, is working one claim with a force of three men.

Pioneer in this field was the Black Rock Mining Co., which has had a force of ten men working with bulldozers, compressors, etc., since last June. The Black Rock company has already shipped considerable ore and has developed large reserves of good milling ore.

The Black Rock Co. is making plans to construct a mill next year and Armstrong & Babcock have announced they will install a mill if they develop enough reserves to warrant such an operation.



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UTAH

Important Scheelite Find Under Development

Three tunnels to be driven—Ohio Copper will drill Big Indian copper mine—Victory rally at Salt Lake

▶ Three tunnels are to be driven at the old Cupric mine, in the San Francisco mining district, Beaver County, as the result of trenching and core drilling over a period of one year under the direction of Ira B. Joralemon, consulting geologist for Metals Reserve. A road is now being built to the tunnel sites to expedite development work. A tunnel from the north, one from the south, and a quick production tunnel are to be driven at once to develop the large scheelite deposit existing in the form of a breccia pipe.

▶ The Ohio Copper Co., of Salt Lake City, headed by Percy H. Kittle, general manager, has taken a lease on the Big Indian copper mine, in San Juan County near La Sal. A contract for drilling to determine the size of the blanket orebody in the sandstone has been awarded to the Boyles Brothers Drilling Co. A considerable tonnage of oxidized ore, containing 2 to 3 percent copper, is believed to exist. If a sufficient tonnage is proved, construction of a leaching plant is to be considered.

▶ A victory rally, seeking to foment greater enthusiasm in war production activities, was held in Salt Lake City on Oct. 31. The rally, promoted by the war production drive branch of WPB, included a parade by Army units, the Salt Lake airbase band, and smelter and defense plant workers. Speeches were made by Reid Robinson, president of the International Union of Mine, Mill and Smelter Workers, who acted as marshal of the parade; D. M. Kelly, Anaconda Copper Co. vice president; W. Ellison Chalmers, chief of WPB's war production drive branch; Major C. G. Peterson, Utah war hero, Col. P. R. Davison, chief of staff of the Ninth Service Command; F. H. Latter, president of the Utah State Federation of Labor; and George A. Rossiter, representing the railroad brotherhoods.

TRI-STATE

New Developments in West Baxter Area

Eagle-Picher to rehabilitate Paxson mine for Metals Reserve—Beck, Dines, and M & W companies to reopen Smith, Hartley, and Brewster mines

▶ Rehabilitation of the old Commerce Paxson mill, preparatory to the dewatering and reopening of the mine workings in the immediate area, has been started by the Eagle-Picher Mining & Smelting Co., as agent for Metals Reserve Co. The Paxson property, comprising 80 acres two and one-half miles west of Baxter Springs and just north of U. S. Highway 166, was last operated by the Commerce Mining & Royalty Co. in 1937. In addition to mining on the Paxson property under the MRC agreement, the Eagle-Picher company will mine on the adjoining tracts of the Swalley and Stoskopf land. The entire operations will be designated: "Eagle-Picher Mining & Smelting Co.—Paxson Operations."

The Stoskopf land comprises 80 acres adjoining the Paxson on the west, and the Swalley acreage consists of an eighty on the east with a 160-acre tract south and east of the north eighty bordering the highway on the south. A sinking derrick has been erected and a new shaft has been started on the latter tract, and another new shaft is to be put down on the Stoskopf. After the extension of a mile and one-half power line to the Paxson property by the Empire District Electric Co., Eagle-Picher will start to dewater the old Paxson underground workings. It is planned to install two Pomona turbine pumps—one a 10-in. and the other a 12-in.—in the pump shaft a short distance north and slightly west of the Paxson mill shaft. Approximately 60 days will be required to dewater the mine, according to H. W. Harrison, of Miami, general superintendent for the Eagle-Picher company, who formerly served in that capacity for the Commerce company when the latter controlled and operated the property. Although the pump shaft is 341 ft. deep, mine operations will be carried on from

the Paxson mill shaft around the 332-ft. level, Harrison said. A 2,000-cu.ft. compressor will be installed in the old compressor house to provide air for underground operations on the Paxson and Stoskopf, and a 1,200-cu.ft. unit will be installed south of the highway for the Swalley development. The latter includes the reopening of an old shaft, just west of the new sinking operation, which also is under way. Ore from the three field shafts, when in readiness for mining, will be trucked to the mill shaft, where surface skip pockets will be constructed to facilitate loading and hoisting.

The mill on the Paxson lease, which has a rated capacity of 100 tons an hour, is of modern construction throughout. Rehabilitation will consist of overhauling and replacement of equipment that has deteriorated since the concentration plant was last operated five years ago. It was reconditioned completely during the forepart of 1937 by the Commerce company, following several years of inactivity during the depression. The large steel headframe over the mill shaft is one of a few in the district where skips are used in the hoisting of ore. The mill shaft is large enough to accommodate double-skip hoisting. Each of the skips will hold more than two tons of ore. Check drilling by churn drills was done in the Paxson area during the summer by the Eagle-Picher company.

▶ Also in the west Baxter Springs mining area, the Eagle-Picher company has revamped two large steel derricks and hoppers on the old Velie Leopard lease, a mile west of the city, and has dewatered the underground workings. A railroad spur has been extended to the two storage units and the shipment of ore to the company's Central mill, in Oklahoma, is scheduled to get underway soon.

▶ The Beck Mining Co. is reopening an old shaft on the Smith land, which adjoins the Eagle-Picher Velie Leopard lease on the southwest, according to R. H. Beck, of Miami, company manager. A new sinking derrick has been constructed over the shaft, which will be reopened to the 310-ft. level. A pump will be installed to dewater the workings, and a 900-cu.ft. compressor will be installed. Ore from this development will be trucked to the company's No. 3 mill on West Nineteenth St. outside the city limits of Baxter Springs. The mill which was last operated as a tailing plant in 1936, has been rehabilitated throughout, preparatory to the treating of ore from mine developments of the MacArthur Mining Co. on the Embry land, four miles west of Baxter Springs and just south of U. S. Highway 166. With a capacity of 50 tons of ore an hour, the mill will be placed in operation as soon as sufficient tonnages are made available for steady and continuous operations, Beck said.

▶ Another development west of Baxter Springs is that of the Dines Mining Co., which has reopened an old shaft on the Florence Hartley land east of the old Federal Homestake. The old shaft was repaired early last summer by the company and is situated a short distance northeast of a new shaft which

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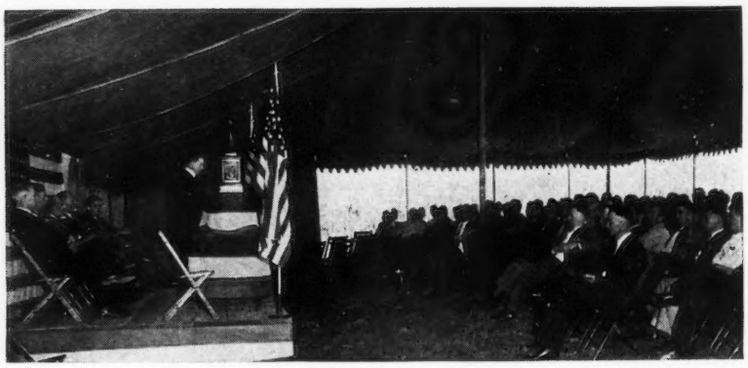

Dr. J. D. Parker, U.S.B.M., making Sentinels of Safety award to personnel of American Zinc Co.'s Grasselli mine, Newmarket, Tenn., Oct. 10

▶TRI-STATE

the company put down this year. A 60-ft. pull-drift is being completed on the 212-ft. level to tap an orebody disclosed by previous drilling, according to H. G. Weidman, company manager. Ore, like that from the company's new shaft, will be trucked to the company's mill north of Picher in Kansas.

▶Mineral Products, Inc., also continues its mine development work on the Velie Swalley tract, a quarter-mile southwest of the Baxter Springs cemetery. Ore is trucked to the Beck No. 1 mill, east of Picher.

▶Almost three miles due south of the Paxson property, the M.&W. Mining Co. is reopening an old shaft on the east end of the Brewster land, a 96-acre mining tract situated a half mile west of Hockerville in Oklahoma. Although orebodies have been cut up to the boundaries of the tract on three sides—east, west, and south—it is practically a virgin piece of mining land. The shaft, which is down to the 170-ft. level, has been repaired around the collar and will be sunk to a depth of 212 ft., according to I. W. Andrews, of Joplin, superintendent. Ore most likely will go to the Beck No. 1 mill.

Several Mines and Smelters Get Army-Navy "E"

RECOGNIZING exceptional service in production for war purposes, the Army and Navy have awarded the coveted "E" emblem to several more mining and smelting operations, including the following: American Smelting & Refining Co., Hayden, Ariz.; American Zinc Co. of Illinois, Monsanto, Ill.; Colorado Fuel & Iron Corp., Pueblo, Colo.; Electro-Metallurgical Co., Niagara Falls; Inspiration Consolidated Copper Co., Inspiration, Ariz.; International Smelting & Refining Co., Miami, Ariz.; Magma Copper Co., Superior, Ariz.; Miami Copper Co., Miami, Ariz.; Nevada Consolidated Copper Corp., Ray, Ariz.; Texas Gulf Sulphur Co., Newgulf, Tex.; and Utah Copper Co., Bingham, Utah.

ARKANSAS

Bureau Expands Bauxite and Zinc Drilling

Silver Hollow Mining Co. proceeding on development loan — November production of manganese ore hampered by wet weather—Former Ozark mill now operating at Polk Bayou.

▶Mining conditions in the Batesville-Cushman manganese field during October were good and some of the producers ran over their September production. Early November conditions were not favorable. Wet weather causes flooding of shallow digs and puts the roads in bad condition.

▶The Ozark Mining & Milling Co., operating the Chapel Hill and St. John mines, in the Cave Creek area, under the management of W. L. Dorsey, produced a small tonnage of wad in October. The mill the company installed to wash and concentrate its ore was not successful. It failed to remove the phosphorus content. The plant was taken over by B. W. Fitzgerald, of Batesville, operating the Southern Hill and Polk Southard, and was set up on Polk Bayou, where it is now in service. Crude now being passed through this plant is coming from old dumps on the Southern Hill and Polk Southard, and a fair production is being made. The plant operates successfully on all but the fines. Sand jigs are now being installed to take care of fine ore.

▶The White River Mining Co., headed by Ed Grigsby, of Heber Springs, Ark., and J. M. Loomis, of Kansas City, Mo., has taken a 120-acre lease from Livingston and Grace, of Batesville, in the Lafferty Creek area. They are installing a compressor and air drills. The property produces both high-grade and wad.

▶In a statement by E. D. Gardner, regional engineer of the Bureau of Mines, Rolla, Mo., the bureau is planning to expand its search for bauxite in Arkansas. The hope is to discover as much ore each month as is mined. Some 3,000,000 tons have been discovered since recent exploration began. Drilling for bauxite is the foremost project of the Rolla division of the Bureau. The office of the State Geologist in Arkansas is cooperating closely, according to Gardner.

▶Mr. Briechta, in charge of the U. S. Bureau of Mines office at Yellville, states that drilling operations in the Rush Creek area are progressing satisfactorily. Three core drills are now in operation, two on the Edith property and one on the Lonnie Boy. The exploration program for this section covers a considerable area. Besides operations on these two properties, the Bureau will also drill the Beulah, Silver Hollow, Red Cloud, White Eagle, Yellow Rose, McIntosh, and one other unnamed property west of Rush.

▶Al Kent, organizer for the AFL, announced Nov. 5 that Local 23227 of the Aluminum Workers of America had been organized in Hot Springs and Malvern, and expects soon to begin negotiations with the officials of the aluminum plant for a contract.

▶A reduction in premiums of about 10 percent on all workmens' compensation insurance coverage in Arkansas, coal mines excepted, will become effective Dec. 5. This will amount to about $350,000 a year, and is due to the excellent experience developed under the new act by Arkansas industrial firms.

▶A $20,000 loan has been granted the Silver Hollow Mining Co., by the government, and a comprehensive development and operations program will start this month. The Silver Hollow is one of oldest mines in the Rush Creek district. John Dirst, of Yellville, is local manager, and W. J. Cushman, mining engineer, formerly of Los Angeles, Calif. Both have headquarters at Yellville. The property is located under a high bluff on Buffalo River, about a mile and a half below the mouth of Rush Creek. Former operations have been carried on with a long tunnel, which penetrates the mountain about 800 ft. The present ore face is jack, and is said to be 80 ft. wide and 12 ft. high, with the floor not determined. The tunnel method is deemed not adaptable to moving a big tonnage of crude from the face. Surveys have been made on the surface, and a shaft will be sunk into the present heading. The crude ore from the face yields from 10 to 12 percent sulphides.

▶The Newton County Mining Co., operating near Jasper, has changed the name of the company to the Newton County Mining & Milling Co. The word "milling" was added because the company expects to do a lot of custom work in the field. The concern is headed by Pete Wells, president, of Jasper; Charles H. Herman, of Chicago, Ill., and A. R. Heidemann, of St. Louis, Mo. The company's new 100-ton concentrating plant is about completed but not in operation yet. The operators have yet to set their engine, install jig troughs, and belt up the equipment. They have added several new properties to their holdings in Newton County, and the entire group now consists of the Keys Gap, Spanish Lamar, two leases on the Brisco, Kilgore, Blue Bluff, American Eagle, and Canton. Besides milling operations conducted on their own ores, they expect to mill ore from the Ponca district and from other mines in Newton County.

MICHIGAN

International Union Wins Bargaining Rights

Soldier-miner quota filled—Mineral industry conference held at Houghton to plan for war and post-war conditions

▶ The Mine, Mill and Smelter Workers Union, Local No. 584, C.I.O., won exclusive bargaining rights at the Calumet & Hecla Consolidated Copper Co.'s mines at a recent election. A total of 943 employees voted for the C.I.O., against 547 for the Independent Copper Workers Union. One hundred and twenty employees voted against representation by either union. The vote was limited to production and maintenance employees. In another group election, which included non-maintenance and non-producing employees, the vote was 86 for the Independent Union and 25 in favor of no union.

▶ Soldiers who have been released on furlough from the United States Army to work in the mines of the Michigan copper district have arrived from Camp McCoy, Wis., which was designated by the War Department as a selection center.

▶ Representatives from non-ferrous mining districts, including Arizona, Montana, Idaho, Colorado, Missouri, and Michigan, went to Camp McCoy to select miners. The soldiers were given the privilege of choosing the mining company for which they cared to work. The percentage of former Michigan copper mine workers at Camp McCoy was small, and local representatives had to select men who formerly worked in iron mines in the Upper Peninsula of Michigan, in addition to a few from the coal-mining regions of Pennsylvania.

▶ Dealing largely with geological and mineral dressing research to aid in the exploration and development of war-needed resources, an Upper Peninsula mineral industries conference was held in Houghton on Nov. 21. The geological engineering department of the Michigan College of Mining and Technology initiated the conference. Delegates included federal and State officials and representatives of Upper Peninsula mining industries and Michigan educational and professional institutions.

▶ Plans were made to mobilize the technical resources of the agencies represented to assure the more effective exploration and development of Upper Peninsula mineral resources which are necessary to the war effort. Steps were taken to coordinate field and laboratory research by government and private agencies on problems relating to Upper Peninsula mineral deposits, and specific projects and fields of activity were selected and assigned. The long-range objectives of the conference were linked with the rehabilitation of the mineral industries after the war. It is proposed to bring up to date the standard monographs of the iron and copper regions and extend geological field work in areas now only partly explored.

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IRON COUNTRY

Lake Ore Shipments Up to Schedule

Inland Steel will open new mine on Mesabi—Negotiations over Babbitt mine at standstill—Great hopes held for Steep Rock Lake deposit

▶ Shipments of iron ore for the Lake Superior district as of Nov. 1 were up to schedule—being better than 17 per cent over 1941 shipments at the same time. There is no question that the planned tonnage will be shipped before the close of navigation in December.

▶ Enlargement of thawing facilities at northern lake ports is serving to improve cold weather shipping capacity somewhat. Contrary to popular assumption, between the time that freezing begins and when the Soo becomes icebound, the main bottleneck to shipping capacity is not difficulty in navigation, but the freezing of the ore in stockpiles, cars, hoppers, and ore pockets.

▶ Inland Steel Co. has begun preparations for the opening of the Atkins mine, at Kinney, Minn. The new mine is named in honor of S. E. Atkins, of Duluth, drill contractor who did the drilling of this property, leased from the State of Minesota. The Kiewet Construction Co. has received a contract for removing the overburden, estimated in places to be as little as 25 ft. thick, and also to mine the ore. The mine will be an open-pit with the truck haulage.

▶ The Interstate Iron Co., the mining company of the Jones & Laughlin Steel Co., has announced that work will soon start on stripping the Columbia Reserve in Virginia. The property will not be ready for production until 1944. The estimated reserve is listed as better than 5,000,000 tons. Grover E. Leveque is the general superintendent with offices in Virginia, Minn.

▶ The negotiations between the Reserve Mining Co. and the War Production Board over financing the low-grade magnetic iron properties at Babbitt, Minn., are at a standstill. It is understood the WPB's attitude is that no help will be given for a new enterprise for the war effort if that enterprise cannot begin production by mid-1943.

▶ Cyrus Eaton, Cleveland financier and founder of Republic Steel Co., announced that an open-hearth test of a 15-ton iron ore sample from Steep Rock Lake, Ontario, had successfully proved that the Steep Rock ore is valuable as a finish ore for reducing the carbon content of high-grade steel. The Steep Rock deposit is of special significance because it is thought to contain the largest remaining reserve of high-grade hard "lump" ore in North America. Exploitation of the deposit will require draining of Steep Rock Lake and the diversion of waters flowing into it. A 125-mile power line and a railroad connection to Port Arthur will also be necessary. Negotiations and legislation to facilitate development have been under way for several months, and the Steep Rock Iron Mines Co. expects to be able to ship 1,000,000 tons of ore in 1944.

▶ Outstanding records of production have been chalked up by several mines operated by Cleveland-Cliffs Iron Co. in Michigan, including the Cliff shaft mine, at Ishpeming; the Lloyd mine, at North Lake; the Spies-Virgil mine, at Iron River; and the Negaunee and Maas mines, at Negaunee. Despite these records, made without substantial increases in underground manpower, and the outstanding results obtained by the "More ore to win the war" contests conducted by the company, no recognition has yet been accorded to any of these mines in the form of Army-Navy "E" awards.

▶ To reach the goal set for it before winter shuts operations down, 3,000 tons a day are being taken from the new Columbia open pit of Republic Steel at Crystal Falls. Bad weather and delays in getting equipment held up the start of operations.

▶ The Ropes gold mine, north of Ishpeming, in which Calumet and Hecla was about to start diamond-drill prospecting on the fifth level, was among those shut down by the WPB edict banning gold mine activity. Apparently, further development will have to be held up until after the war.

CANADA

Ban Lifted on B. C. Gold-Mine Labor

Fund of $10,000,000 to develop submarginal critical minerals — Kerr-Addison makes record blast—Dome will investigate new molybdenum and scheelite finds

▶ Ottawa has issued a warning that gold mining is to be further curtailed; the Metals Controller, George C. Bateman, warns that there may be no operating gold mines left in the Dominion if the war lasts another two years. However, there is less apprehension in Canada of the drastic consequences to gold production than that which followed immediately on orders for a blackout of straight gold operators in the United States. Up to the middle of November there had been no change in the priority rating allowed Canadian gold operators so far as purchases of American equipment were concerned, apparently because of recognition of the dependence of Canadian economy on gold mining. In northern Quebec and Ontario the gold camps are the primary support of colonization communities, and Kirkland Lake and Timmins are trade centers that have no other means of support than the gold mines. Information has been prepared by mining companies in these two cities for delegations to present at Ottawa showing that, out of a total of about 10,000 employees, only approximately 3,000 are miners who would be useful for work underground in base metal mines at Sudbury and elsewhere. International

Nickel officials have stated that unskilled labor is adequate to fill the labor deficiency, after being given special training subsequent to employment. Farmers from the prairie region of Manitoba and Saskatchewan and from the Abitibi district of Quebec are taking an increasingly important part in filling the gaps in gold-mine payrolls. At the same time, the larger mines have stopped development work and reduced daily output well below mill capacity. After three years of recruiting and competition from well-paid jobs in war plants, there are no large numbers of miners remaining in Canada's gold camps available either for munitions plants or for work in base-metal mines. February has been officially set as the time when Canadian war industry will reach its maximum and there is expected to be a surplus of labor from construction projects available for other employment after that time. There are indications that no radical changes will be made in government policy affecting gold operators within the immediate future.

▶ Important deposits of chromite in the Bird River area of Manitoba are undergoing diamond drill exploration while metallurgical tests are being made both at Flin Flon and New York, in the interests of Hudson Bay Mining & Smelting Co. After the freeze-up, a shipment of 200 tons will be sent to the ore dressing laboratories at Ottawa.

▶ By an Order-in-Council passed on Oct. 22, the Metals Controller has been authorized to pay up to $100,000 for mica produced in Canada. A mica stockpile has been made possible by the discovery and development of several deposits in Papineau County, Quebec, and Renfrew and Frontenac counties, Ontario.

▶ An expanding market has been found for crude and ground barytes produced at Walton, Nova Scotia, by Canadian Industrial Minerals. Since its first production two years ago,, the company has been supplying substantial tonnages to the oil industry in Trinidad and to the linoleum industry in the Eastern states for the manufacture of lithopone. Shipments this year amount to 11,700 tons and unfilled orders total about 3,000 tons. This enterprising pioneer development has been carried on by Springer Sturgeon Gold Mines.

▶ After overcoming severe transportation obstacles, Missinaibi Clays & Mining reports the first shipment of several cars of refractory clay from its quarry 14 miles north or the railway at Smoky Falls, Ontario. A 550-ton grinding plant has been installed and the company is prepared to make regular shipments of silica sand, kaolin, and refractory clays.

▶ The Department of Munitions and Supply has announced a $10,000,000 fund available for the development of marginal and submarginal ore deposits to supply critical materials, including copper, zinc, graphite, and mica. Negotiations between the Metals Controller and Metals Reserve Co., of Washington, led to establishing this fund for the purpose of increasing domestic production and acquiring stockpiles of metals and minerals essential to war production.

The things that give trouble were "*included out*" in designing this pump

Over the last 30 years Amsco has built a lot of pumps—more than half of those used for sand and gravel production; pumps for ash handling in power plants; ore and tailings movement in metal mines; and for contractors: services that are very abusive and which demand the ultimate in design and construction materials. Therefore, many of the operating problems that might arise are well known to us.

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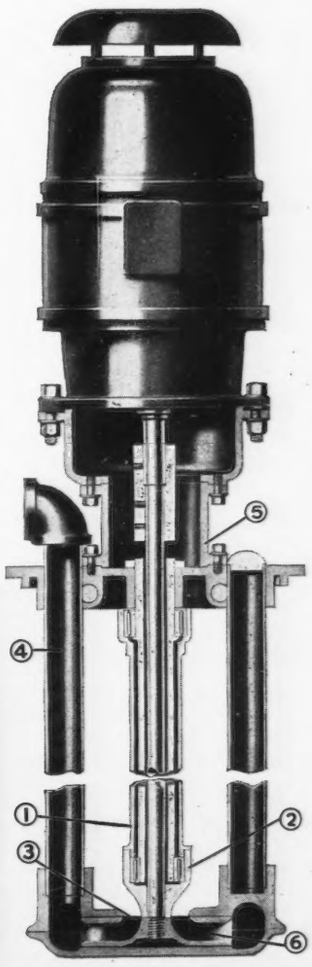

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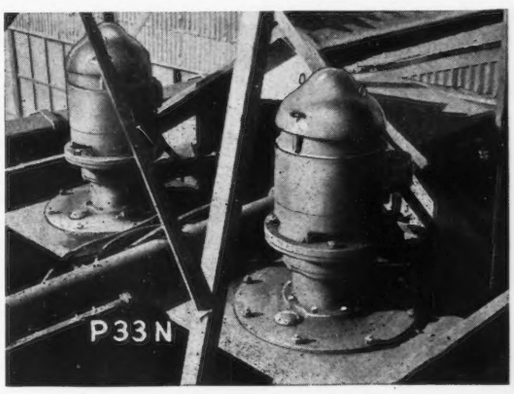

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600-ton concentrator of Golden Manitou at Val d'Or, Que., which will be enlarged to 900 tons. Zinc output is under contract to Metals Reserve

▶CANADA

ONTARIO

▶Deep development at Aunor Gold Mines, in the Porcupine camp, is showing satisfactory results, and considerable increases have been made in ore reserves from the 500,000 tons reported at the first of the year. Working capital has been built up from the $613,285 that was last announced. Adequate labor has made it possible for the company to show the highest earnings in its history, since the start of production early in 1940. Stanley S. Saxton is mine manager.

▶Since completing shaft sinking last year, Leitch Gold Mines has been carrying on development of a block of six new levels, with indications of materially strengthening the mine's ore position. On the 10th level, the first to be opened in the new program, an average ore width of 22.7 in. has been extended for a length of 1,270 ft., with a gold content of 1.25 oz. The ore length on the 11th level is 1,425 ft., with an average width of 34 in., although good values in some sections persist across 10 ft. Development on both the 12th and 13th levels is incomplete, and on the 14th there is an indication of ore lengths totaling more than 1,000 ft. Both widths and values at these lower horizons are better than mine average.

▶Since starting its 500-ton mill a year ago, Jerome Gold Mines has been able to build up a satisfactory cash position. Controlled jointly by Mining Corp. of Canada and Hollinger, Jerome has made an initial payment on loans amounting to $680,000. The property is 80 miles north of Sudbury and has so far been able to obtain adequate labor in spite of its isolation. On the bottom level at 800 ft. there is promise of ore lengths similar to those on the upper horizons, including the 2,000 ft. disclosed on the 350-ft. level. A. C. Ballackey is mine manager and John Knox consulting engineer.

▶An interim report to shareholders by R. A. Bryce, president of Macassa Mines, states that the mine remains in excellent physical condition as a result of exploratory and development work completed within the last three years. Limited development work is possible under present labor shortages, which have made it necessary to reduce the daily mill rate from 425 to 345 tons. The number of employees has declined 23 percent since the first of the year.

▶Production at Kirkland Lake Gold Mines in the first nine months was 77,566 tons averaging $14.19, compared with 113,066 tons averaging $13.50 a ton in the same period last year, the decrease being the result of labor shortages. Although no mill feed is being drawn from below the 4,900-ft. level, an important tonnage has been indicated in the series of branch veins forming hanging-wall orebodies associated with the No. 6 vein. Only partial exploration has been possible in the block of ground from 4,000 down to 5,000 ft., but some good ore sections have been opened on the 5,400-ft. level. The hanging-wall orebodies are regarded as an asset of great value to be developed in future years.

▶Teck-Hughes Gold Mines, with mill capacity of 1,300 tons per day, treated an average of only 260 tons in the first four months of this year and 280 tons a day in the four months ended August 31. Operating profit for the first eight months was $371,966, to which was added income of $670,523 from Lamaque dividends. Ore reserves are 327,696 tons, good for about 3½ years of operation at the present greatly curtailed milling rate. None of this year's production has been drawn from below the 20th level; a large part of the blocked-out ore is between this horizon and the 50th level.

▶Cochenor Willans Gold Mines, at the southeast end of Red Lake, has developed a series of three veins in the northeast section of the mine with an ore grade established at $22.91. In the first three months of the company's fiscal year, ended Aug. 31, the mill recovery averaged $21.90 a ton, compared with $18.19 for all of last year and $15.64 in 1940. Improved grade occurs in vein structures that had not formerly been known in the mine, where most of the mill feed has been derived from a series of irregular replacement zones. In spite of reduced development due to labor shortage, ore reserves have been increased due to the important way the new section of the mine has responded to recent exploration, following its discovery by diamond drilling out from the 275-ft. level. Dr. R. Thomson, who formerly worked in Newfoundland at the Buchans mine, is resident geologist. Dr. E. G. Bishop is consultant and John A. Reid is consulting engineer. The mine manager is W. P. Mackle.

▶The net earnings for Wright-Hargreaves Mines in the fiscal year ended Aug. 31 amounted to $2,500,000, against $3,817,810 in the preceding twelve months. Milling has not been restored to the 1,200-ton rate that was in effect before the strike. The labor shortage that is becoming increasingly critical is holding output to about 800 tons a day. Reduced development work has made it necessary to draw steadily on blocked-out ore. Reserves at last report stood at $26,000,000. New ore continues to be found on upper levels, but below 6,000 ft. the orebodies appear to be less promising.

▶According to the third-quarter report of E. L. Brown, general manager, normal production is being maintained by Sherritt Gordon only at the expense of development work, because of a labor shortage. For the same reason, the company has discontinued work on the low-grade copper deposit at Bob Lake. Shaft sinking was completed at the Josephine mine, Michipicoten area, at 1,050 ft. The lake basin overlying the orebody was nearly drained. Drilling on an adjoining property indicated a tonnage exceeding 8,000,000 tons of siderite ore.

▶The report submitted to the directors of Ontario Nickel Corp. by Charles L. Hershman, consulting engineer, on Oct. 22, indicated gratifying results from development work. Drifting for 166 ft. on the 250 level has been in massive sulphides for the entire length, with 240 ft. yet to be driven. The orebody has an average width of 10 ft. and as currently developed is estimated to contain 83,000 tons of ore carrying from 3½ to 4½ percent combined nickel and copper, principally nickel.

▶J. P. Norrie, general manager, announces that five tons of high grade, trimmed, strategic mica has already been produced from the pegmatite dikes being developed at Eau Claire, Mattawan Township, by Inspiration Mining & Development Co.

▶On Nov. 9, at Larder Lake, Kerr-Addison made a record blast, the result of ten months of drilling and loading, which broke 275,000 tons of ore. More than 7,900 drill holes were loaded with 44½ tons of dynamite. It is anticipated that this is a sufficient supply of ore to run the mill a year. A substantial tonnage of scheelite is reported.

▶A discovery of tungsten ore which may prove to be of unusual importance was made in late September on Eabamet Lake, Albany River district, by prospectors in the employ of Dome Mines, Ltd. The find was made on claims acquired in 1941 after a party of prospectors had discovered showings of scheelite. Further prospecting during the summer of 1942 failed to disclose anything of importance. The plane which was to take the party out was delayed a few days, and as an

afterthought, the party decided to try the violet ray apparatus at night. In so doing, scheelite was discovered in barren-looking andesite which had shown nothing under cloth in the daytime. The deposit is of unusual dimensions for tungsten-bearing ores, a width of 7 ft. being indicated in four trenches spread over a distance of 150 ft. The limited time available to the party did not permit further investigation, and it is planned to make a more elaborate study as soon as the freeze-up permits travel into the area.

QUEBEC

▶ Sladen-Malartic Mines has improved gold recovery to the extent of $1.25 a ton, compared with all of 1941. The mine manager, R. R. Basserman, reports average production at $4.68 a ton and operating costs at $2.92. With monthly output at about $100,000, the company has built up ore reserves of 730,000 tons and net current assets of $432,000. The No. 2 shaft is being deepened from 725 to 1,750 ft., with five levels to be opened below the 950-ft. horizon.

▶ Reduced development work at McWatters Gold Mines has led to an increase in operating profits in the first nine months of the year, although gold output has been about the same as in the first nine months of 1941. Recovery averaged $7.60 and working costs $5.69 a ton for the 189,535 tons treated this year. Failure to discover any ore of consequence in recent months has placed the mine in the category of a salvage operation, with known ore sufficient for less than a year's milling. W. B. Hosking is mine manager.

▶ Gold recovery and tonnage treated by Sigma Mines in October were only slightly lower than the best month in the mine's history. In the first ten months Sigma has produced $2,544,656 from 336,311 tons, an average of $7.56, against $7.72 a ton for all of last year.

▶ In the fiscal year ended Sept. 30, O'Brien Gold Mines showed ore reserves of 158,541 tons of average grade of $14.82, adequate for about two years of operation. Harry Sparks, mine manager, reports normal recovery of arsenic from the roaster and a labor situation that is not yet critical. This property, together with Central Cadillac and Lapa Cadillac, are the only surviving gold producers in this area.

▶ Lamaque Gold Mines, one of the most successful operators in the province, reduced tonnage in August to 925 from the rated capacity of 1,300 tons a day. Output for the first eight months was $3,200,129, only $35,000 under the first eight months of 1941 and an average of $11.61 per ton. Positive ore reserves reached the highest figure in the mine's history at 1,042,897 tons averaging 5.51 dwts. Development and mining expense amounted to $4.06 a ton.

▶ Waite Amulet Mines has stepped up milling to 1,800 tons daily to include 300 tons of zinc ore, following a recent contract with Metals Reserve Co. to take extra zinc concentrates. Production of high-grade copper ore from the Lower

WINNING THE FIGHT FOR METALS

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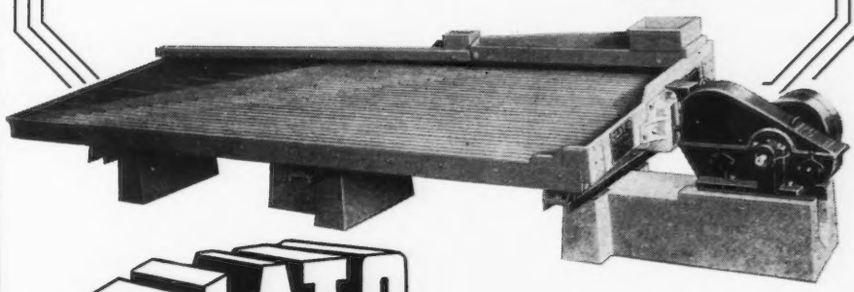

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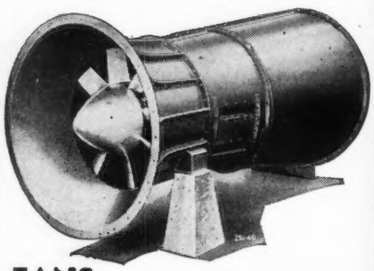

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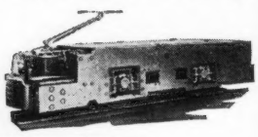

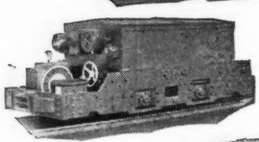

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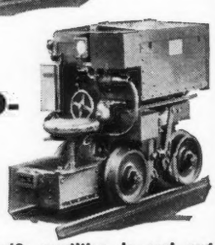

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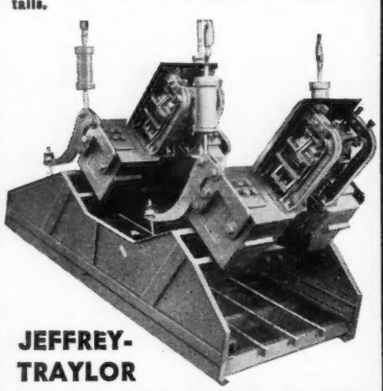

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▶ CANADA

"A" orebody, under the subsidiary Amulet Dufault Mines, provided net profits of 35¢ a share in the first half of this year, compared with 23¢ a share in the first half of 1941.

▶ Siscoe Gold Mines reports bullion production of $1,349,551 in the first nine months of 1942, as against $1,276,247 in the same period of 1941. The 1,000-ton mill continued to operate efficiently on lower-grade ore averaging $4.94 as compared with $7.13 a ton last year, with greatly lowered working costs. The mill rate in 1941 averaged 670 tons a day.

▶ On Oct. 24, George C. Bateman, Metals Controller, informed the Combined Raw Materials Board in Washington that a large deposit of molybdenite had been discovered in the gold belt of northwestern Quebec. Assays from drill core intersections show values ranging from 0.245 percent to 1.188 percent. The average width appears to be about 30 ft. On Oct. 15 it was reported that 35 drill holes had been put down, indicating ore to a depth of 200 ft. and for a 400-ft. length, with both ends open. The work is being done by Dome Mines, which controls more than 4,000 acres in Preissac Township. Some molybdenum was produced here during the last war, but the new discovery, located under muskeg, differs from any other known Canadian deposits in its apparently large size and good grade. First picked up by No. 16 drill hole in a section where no outcrops existed, the mineralization occurs in schistose quartz in red and gray granite. Preliminary production plans are for the shipment of 150 tons daily to the mill of Mic-Mac Mines, 8 miles southwest. A steam mining plant is being installed in preparation for initial production sometime this winter.

▶ Sullivan Consol. Gold Mines has completed installation of a concentrator for scheelite, which is to be recovered at a monthly rate estimated at $2,000. The mine machine shop is engaged in war work, in company with many other gold producers in the Rouyn-Val D'Or area. The engineering staff has examined a number of potential strategic metal properties during the past field season and a prospecting crew is now engaged on a molybdenite property in LaCorne Township, east of Preissac and near the former Molybdenite Reduction property now being developed by Siscoe under agreement with Wartime Metals Corp. The price of molybdenum has been increased from 49½¢ per pound to 90¢ per pound of MoS_2 contained in 80 to 90 percent concentrates, delivered at Ottawa.

BRITISH COLUMBIA

▶ The British Columbia government has announced that no further "Special" placer-mining leases will be granted for the duration of the war. "Special" placer leases cover a minimum of 2½ square miles and were instituted to encourage investment in large operations involving the use of costly equipment. Such leases were issued only by Order-in-Council, whereas ordinary leases, covering only half a mile along a stream by a quarter of a mile in width, are issued by mining recorders. No change is to be made in the normal application for ordinary placer leases.

▶ Mining corporations made a substantial contribution to the success of Canada's Third Victory Loan in British Columbia and the Yukon Territory. Although several companies requested that no publicity be given their subscriptions, the following are known to have been received: The Consolidated Mining & Smelting Co. of Canada, Ltd., $5,000,000; The Howe Sound Co., for the credit of Britannia Mining & Smelting Co., Ltd., $1,000,000; Premier Gold Mining Co., Ltd., $150,000; Privateer Mine, Ltd., $125,000; Silbak Premier Mines, Ltd., $100,000; The Granby Consolidated Mining, Smelting & Power Co., Ltd., $100,000; Surf Inlet Consolidated Gold Mines, Ltd., $100,000; Cariboo Gold Quartz Mining Co., Ltd., $75,000; The Yukon Consolidated Gold Corp., Ltd., $50,000; Gold Belt Mining Co., Ltd., $50,000; Central Zeballos Gold Mines, Ltd., $40,000; and Kootenay Belle Gold Mines, Ltd., $35,000. The workmen's committees of the employees of the Consolidated company subscribed $450,000 from their pension fund to be allotted $350,000 from the Trail committee and $100,000 from the Kimberley committee.

▶ Gold-mine operators in British Columbia and the Yukon have been assured that no further application will be made of the federal order which prohibited them from employing new labor in the mines. The order had not only stopped the replacement of those leaving the industry, but had also created a certain measure of panic among those remaining, with the result that operations were very unstable. After several unsuccessful attempts to have the order rescinded through appeals to the National Selective Service, the Mining Association of British Columbia finally took the matter to the Prime Minister of the Dominion. The Premier had previously stated that while steps must be taken to curtail gold production further, such plans "will have due regard to the nature of the industry and to its continuance as a soundly functioning industry in the post-war period."

▶ During the quarter ended Sept. 30, tonnage milled by Base Metals Mining Corp., Ltd., subsidiary of The Mining Corp. of Canada, Ltd., operating in the Golden mining division, was 14 percent below the preceding three months, due to the labor shortage. Exploration and development were severely curtailed for the same reason, but diamond drilling in the Kicking Horse mine indicated sufficient new ore to offset that mined. Estimated operating profit for the first nine months of 1942 was $139,603. Lead and zinc concentrates were shipped as produced.

▶ Kootenay Belle Gold Mines, Ltd., pioneer gold producer of the Sheep Creek area of the Nelson mining division, which is expected to close at an early date through the exhaustion of ore reserves, has acquired an option to purchase the assets of Whitewater Mines, Ltd., including the silver-lead-zinc mine and 160-ton mill at Retallack in the Slocan mining division.

▶During the quarter ended Aug. 31, 1942, the first quarter of its current fiscal year, Sheep Creek Gold Mines, Ltd., leading gold producer of the Nelson mining division, received $224,521 for its output of gold bullion; miscellaneous income brought gross income to $227,845. October production was valued at $68,270, from 4,729 tons, averaging $14.44 per ton.

▶October output of Gold Belt Mining Co., Ltd., Sheep Creek area, was valued at $60,057, from 4,523 tons, averaging $14.86 per ton.

▶On account of the large proportion of arsenic in the concentrates shipped to the Tacoma smelter and its extreme value at the present time, special consideration has been granted both Hedley Mascot Gold Mines, Ltd., and Kelowna Exploration Co., Ltd., Osoyoos mining division gold producers, by the Dominion government, permitting them to hire mine and mill labor to rebuild depleted staffs.

▶Granby Consolidated Mining, Smelting & Power Co., Ltd., operating the Copper Mountain copper mine and Allenby concentrator in the Similkameen mining division, reports operating profit for the quarter ended Sept. 30, 1942, at $118,742 after provision for income and all other taxes; and, after deducting reserves for depletion and depreciation, the net income for the quarter was $45,463.

▶Bralorne Mines, Ltd., is developing a cinnabar deposit on Silver Creek, near Takla Landing, in the Omineca mining division. More than 30 men are now at work, and will continue throughout the winter. A tractor road more than 100 miles long is being constructed from Fort St. James to replace the water route, which is now frozen. Following an extensive diamond-drilling program a shaft is being sunk, after which lateral development will be undertaken. The Consolidated Mining & Smelting Co. of Canada, Ltd., has acquired an option on the Snell group of cinnabar claims adjoining those now being developed by Bralorne.

▶The ceiling on wages, which has adversely affected copper-mining operations in this Province, has been lifted in the case of Britannia Mining & Smelting Co., Ltd. The National War Labor Board has granted the big Howe Sound subsidiary permission to pay a special underground bonus of 35¢ daily together with a copper bonus of 25¢ daily. This brings the wage scale virtually up to that obtaining in the Bridge River and Zeballos gold mines.

▶The Twin "J" Mines, Ltd., has been incorporated as a subsidiary of Jason Mines, Ltd., Ontario gold producer, and the new company has already commenced work on the construction of a 150-ton mill at the Mount Sicker copper-lead-zinc property recently acquired from Tyee Consolidated Mining Co., Ltd. It is hoped to have the new plant in operation by spring. C. Rutherford, late manager of the Jason operation at Casummit Lake, Ont., has arrived to take charge of construction and development. Arrangements have been completed with Wartime Metals Corp.,

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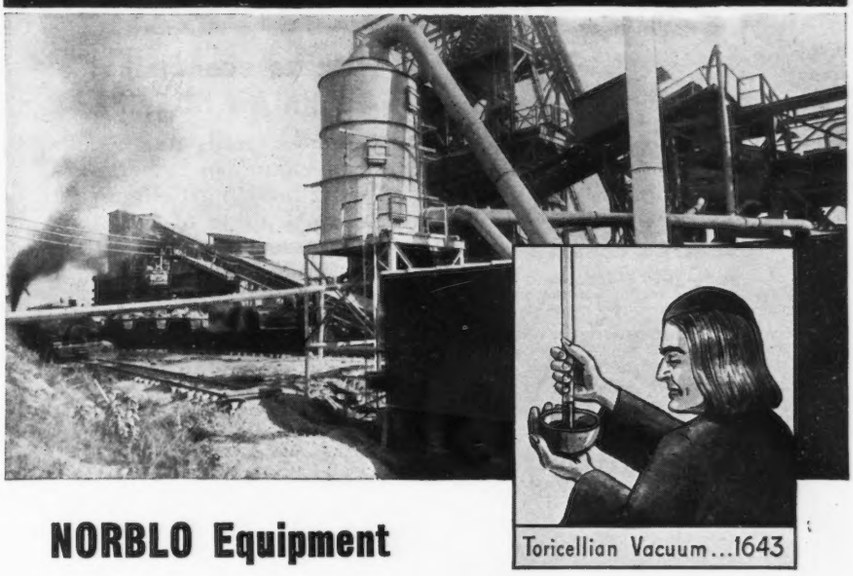

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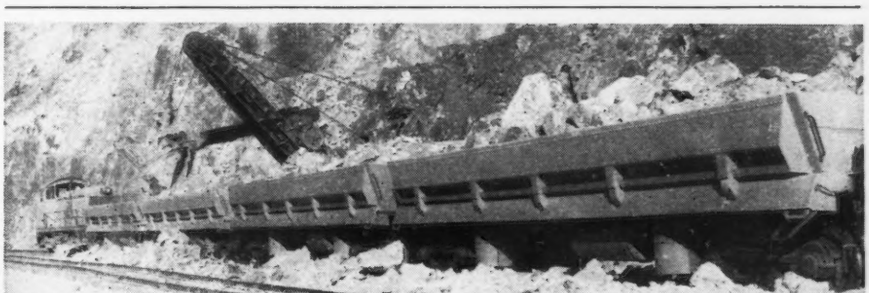

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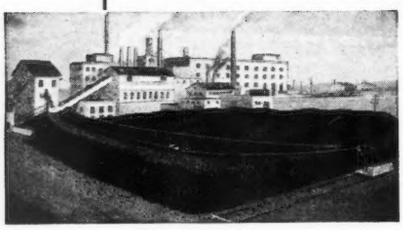

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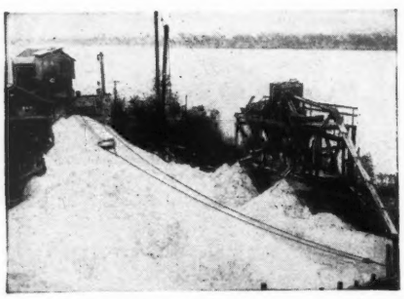

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▶CANADA

the federal government subsidiary, for the disposal of copper, lead, and zinc concentrates.

▶During September, production of Privateer Mine, Ltd., only surviving Zeballos gold operation, fell to 1,594 oz. gold, valued at $61,386, from 1,720 tons, averaging 0.927 oz. gold per ton, the lowest since the mill was increased to its present capacity.

▶Another in the long list of war casualties among British Columbia's gold mines, Surf Inlet Consolidated Gold Mines, Ltd., has suspended operations for the duration of the war. During the past year a vigorous development program had been prosecuted, frequently at the expense of production, particularly after the labor shortage became critical. Ore reserves have been improved considerably as a result of this work and, as the company is in excellent financial condition, it is expected that this will be one of the first properties to resume production when circumstances become more favorable.

Bateman Appeals for Timber Conservation

ON NOV. 6, Canadian Metals Controller G. C. Bateman issued an appeal to Canadian mines to conserve timber to the fullest possible extent. Demand has run ahead of estimated needs and the supply situation is critical. This is due not to any shortage of standing timber but to lack of manpower and transportation facilities.

Brazil Gets Rail Equipment to Develop Itabira Iron

BRAZIL, says a report from Rio de Janeiro, has received 3,000 tons of steel rails and 25 freight cars from the United States for use on the Victoria-Minas Railroad, a vital transportation link to the rich Itabira iron mines.

The Victoria-Minas Railroad is being improved in accordance with a United States-Brazilian agreement to increase the flow of ore from Brazil's vast iron reserves for use by United Nations war industry and Brazil's own expanding steel industry. The Export-Import Bank of Washington has extended credits to aid this development. Equipment must come mainly from the United States until Brazil is able to expand her own steel output and the heavy industries dependent upon steel.

Plans call for increasing the railroad's hauling capacity to around 2,500,000 tons yearly from a capacity of about 250,000 tons. Whether this goal is reached soon, it is said, will depend in large part on how much equipment the Brazilian railroad is able to get from the United States. War industry absorption of materials in the United States and shortage of shipping space hamper the movement of heavy rail equipment south to the other Americas.

MEXICO

Pachuca Miners Demand 30 Percent Pay Hike

Guanajuato mines cramped for equipment and supplies—Gratifying improvements made in base- and strategic-metal production—Progress made on Altos Hornos iron and steel works

▶ Mining in Mexico continued its upward trend with the approach of winter. A most favorable turn by labor was the announcement by the national miner's union in connection with the making of contracts with Altos Hornos de Mexico (backed by American Rolling Mills) for a working personnel for the iron and steel works being established at Monclova, Coahuila, that it will provide only the most experienced, competent, and reliable men for these jobs and that it intends to carry through with that policy for the entire mining industry. However, demands for increased pay are being made upon several companies.

▶ Complaint has reached the national commission for stimulation of the mining industry from several Guanajuato mines, names of which are not revealed, that unless they can quickly obtain badly wanted machinery, machinery replacements, and such material as cyanide from the United States, they will be forced to close. It is reported that the government has acted to accommodate these mines.

▶ The Federation of Cooperatives of the Mining and Metallurgical Industry of the Mexican Republic, which claims 42 units with a membership of 35,000, just a year old, is organizing a technical consultive council, composed of a mining engineer, a metallurgist, a practical miner of recognized competence, an assayer, an accountant, and a sampler, to assist its members in all possible ways for more and better production. Member miners are to be taught how to work on their own, instead of depending upon regular wages, and means will be sought for establishing treatment plants for the cooperatives.

▶ This fall has seen a 30 percent increase in mercury production over the output during this period of 1941, Mexico City mining circles say. Mercury mining is now on a national scale, with Guerrero, Aguascalientes, and Zacatecas leading, as many deposits that had been idle before increasing demand and prices made this work profitable are now in full exploitation. High recovery of mercury is reported from various mine dumps through increased use of the concentration method, especially in Aguascalientes and Zacatecas.

▶ Expropriation by the National Railways of the 9-mile railroad of El Oro Mining & Railway, a British company, which operated for some years between Tultenango and El Oro, State of Mexico, was announced by the Ministry of Finance, which explained that it took this action because the company was unable to pay it a debt the ministry estimated to be approximately the value of the railroad.

▶ Carnegie Bote Mining, Zacatecas City, won an important labor lawsuit when the federal supreme court granted its appeal from a ruling of the federal board of conciliation and arbitration that it must compensate Max Sigg, a former employee, for alleged unjustified dismissal. The court held that complete proof must be given in each case of compensation claim for unjustified dismissal, otherwise allowing such claims is a violation of the labor law. The company said it had been obliged to discharge Sigg because of his general inefficiency. The court's ruling establishes a precedent in cases of this kind.

▶ An array of facilities is being arranged for the iron and steel works that Altos Hornos de Mexico, S. A., head of which is Gen. Abelardo L. Rodriguez, ex-President of Mexico, is preparing at Monclova, Coahuila. The National Railways has nearly completed a spur line 5½ km. out of Monclova to the site of the works. Only a kilometer of this line lacks completion. When this spur is ready, 200 carloads of heavy machinery and other equipment can be moved to the works site from Monclova. Coal and coke are to be supplied Altos Hornos by mines and plants at Nueva Rosita, Cloete and Palau, Coahuila.

▶ Emiliano Vazquez Herrera, prominent mining man of Canatlan, Durango, has obtained a federal concession to build and operate a treatment plant to service mines that have been restored to work in the San Lucas sector, Ocampo municipality, as well as the ore of prospectors in that region. This plant is expected to be in operation early next year.

▶ Satisfaction with the way miners and mining companies are living up to their pledge to the federal government for more and better work is expressed by the Ministry of National Economy. The Ministry is particularly pleased with Mexico's current production of copper, lead, and zinc, and estimates that this country will have ample stocks of these metals for home needs and export for the duration. No current figures on mining production are being released by the Mexican government. This is a war measure.

▶ Demand for a general pay raise of 30 percent is being considered at conversations representatives of employees of Cia. Minera de Real del Monte y Pachuca, S.A., Pachuca, Hidalgo, and the company are conducting under the supervision of the Labor Ministry. It is expected that this demand will be granted with the making of a new work contract.

▶ Although the Mexican government suspended the production tax and 12 percent export tax on silver, as reported in *Engineering and Mining Journal* for October, p. 103, a special new "emergency tax" was immediately imposed of $2.25 (U. S.) per kilo. Prior to the new price of 45c. per ounce, the production tax was only 98c. (U. S.) per kilo and silver was exempt from the 12 percent export tax.

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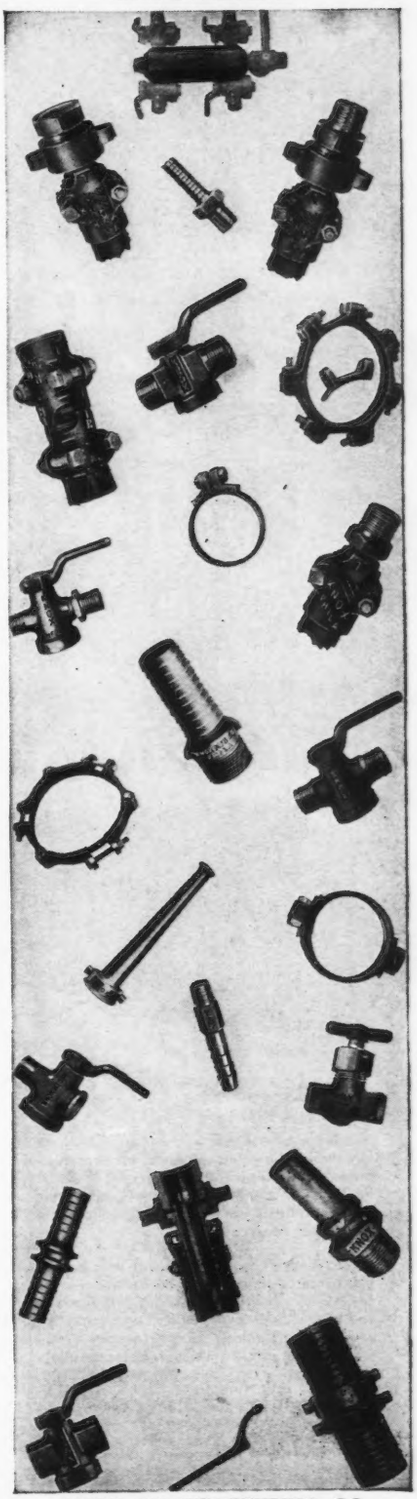

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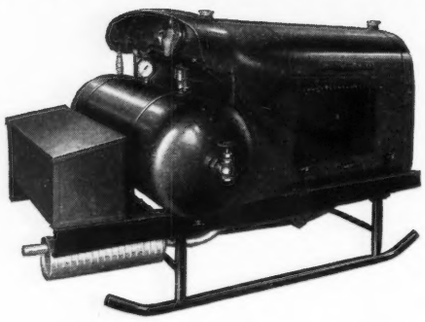

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CHILE

New Type Cyanide Plant at Petorca

New leaching-cyanide unit at Copiapo operating—Cerro Negro copper deposit to be opened—Copper mills, converted to gold, now handling copper again

▶Callejas Bros., who also own the Capote mine and cyanide mill in Atacama Province, are about to start up their new cyanide mill in Petorca, Aconcagua Province, of 120 tons' capacity per 24 hours. This new mill is of interest to cyanide men because it has adopted the new Wynne system of continuous agitation and filtration in the same agitating tanks, thus doing away with thickeners for thickening and countercurrent washing. In the Wynne system, the pulp as discharged from the classifier goes direct to the first agitator of the series which in this particular operation is of the Devereux type. This agitator is provided with a stationary type of filter placed inside the agitator and is similar in construction to the baskets used in the Moore type of filter. The agitators are cylindrical in shape and their size and number must be calculated to give the ore the required contact time to dissolve the values it contains. In this mill there are three 24x12-ft. agitators in series. While the pulp is being agitated in the usual manner, suction is applied to the leaves of the filter, either by means of a vacuum pump or a self-priming centrifugal pump—experience so far having proved that the self-priming pump is just as efficient and cheaper—and the pregnant solution is drawn through the leaves of the basket. After being clarified the solution is sent to precipitation. When the cake on the leaves has reached a convenient thickness, suction is stopped and air under compression is injected on to the leaves and the cake is discharged inside the agitating tank. This operation is repeated at regular intervals, and as solution is continuously drawn from the agitator through the filter leaves, the pulp is gradually thickened. The thickened pulp is discharged by gravity to agitator No. 2, which is exactly equal in size and also furnished with the Devereux type of agitator and two baskets of leaves as in the first tank. Here the operation of simultaneous agitation and filtration is continued until the pulp reaches a ratio of solution to solids of 1½ to 1 or 1 to 1. Pulp from No. 2 agitator discharges to No. 3 agitator, exactly equal to Nos. 1 and 2, the only difference being that, whereas in Nos. 1 and 2 agitators the filter baskets are fixed, in No. 3 they are movable and can be drawn out of the tank with a crane when the cake has reached the desired thickness. Operation is carried out in contiguous 8-ft. diameter tanks with conical bottoms. Barren solution and wash water is also added to No. 3 agitator as required. This new and simplified method of cyanidation has been patented by the inventor, Mr. Wynne, an Allis-Chalmers engineer well known to Chilean and Peruvian miners.

▶The leaching-cyanidation plant at Copiapó for the beneficiation of copper-gold ores has begun operations. As already explained in a previous number of *Engineering and Mining Journal*, this mill was designed for the treatment of complex gold ores the content of which in soluble copper is too high for direct cyanidation. Such ores are plentiful in the mining districts around Copiapó, but up to the present they had to be concentrated by flotation, with recoveries for both copper and gold that cannot be considered satisfactory. An interesting feature of this plant is that instead of using sulphuric acid for leaching the soluble copper, the price of which is almost prohibitive in Chile, $NaHSO_4$, a byproduct from the manufacture of HNO_3, is employed. No definite results as to recovery and costs can yet be given, but results are encouraging. However, it has already been determined in the mill that the settling rate of these copper-gold ores in the acid solutions is much slower than the figures that were obtained in the laboratory and that much greater settling area in the washing thickeners of the acid circuit will be required in practice.

▶During last week an agreement has been made between Compania Minera Punitaqui, Corporación de Fomento a la Producción, an organization similar to the Reconstruction Finance Corporation, and the owners of the property, to bring into production the well-known Cerro Negro copper deposit, situated 22 miles from the town of Cabildo on the Longitudinal Railroad, in Aconcagua Province. At least $400,000 will be spent in preparing the mine for exploitation by open-cast and underground methods; building an aerial ropeway 3 km. long to the mill site; construction of a 400-ton-a-day flotation mill; and the necessary offices and housing facilities for the employees. Power will be purchased from the Compania Chilena de Electricidad and a power line will have to be built from Chagres to the mill, a distance of some 25 miles. The current will be transmitted at 44,000 volts. About 500,000 tons of 3.5 percent copper ore are proved, but the mine shows promise of containing a much larger tonnage. The deposit can be best described as a superficial bed of copper-impregnated porphyry. Chief minerals are bornite, chalcocite, and malachite. The concentrate will be smelted in the nearby Chagres smelter.

▶Within the last few months the Caja's mills of El Salado and Punta del Cobre, located in the Atacama Province, have again started milling copper ores after treating gold ores almost exclusively for about ten years. It is interesting to recall the fact that both these mills were designed and built twelve years ago by Caja de Crédito Minero for the beneficiation of copper ores exclusively. However, when the mills were ready to operate, the price of copper reached unheard of low figures; the depression was so great in Chile that the currency was debased to less than one-sixth of its value in 1932, and low-grade gold mines became an asset. Now, as far as winning the war is concerned, gold seems to be of little use.

PERU

Banco Minero Fosters Mine Development

Higher silver prices stimulate mining activity—Domestic copper wire factory announced—U. S. Government cooperates on mining education

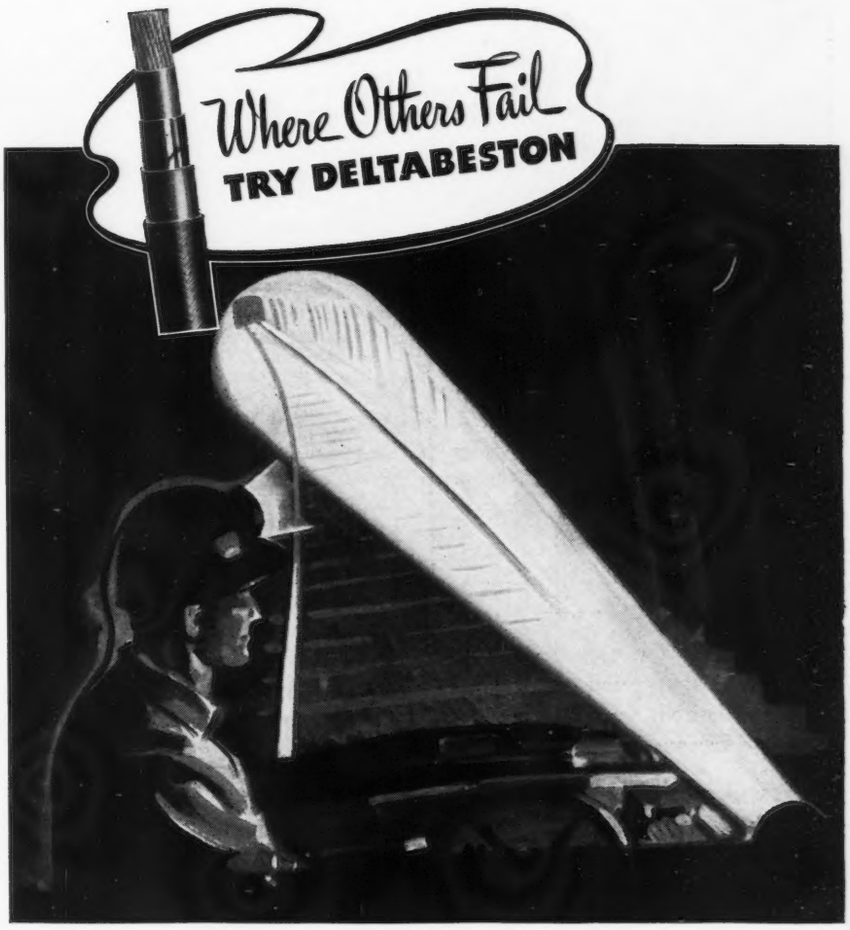
▶ The Banco Minero del Peru is doing intensive prospecting in the Hualgayocc region, about 400 miles north of Lima, east of Pacasmayo, in the Department of Cajamarca. The region was discovered in 1771 by a Spanish miner by the name of Rodriguez de Ocaño, and was famous during the Spanish conquest, because of the high-grade ores it contained. In modern times Hualgayocc has been worked in a small scale, there being no large deposits, but only many small veins carrying high values in silver and gold. A small concentration plant, with a daily capacity of 25 tons, has been operating there for the last few months, but it treats ore from only one mine, and cannot be considered a custom mill. The Banco Minero has in view the installation of a larger unit, which will permit the development of the region and the operation of the many small mines. This program has been influenced greatly by the higher price of silver.

▶ The automobile road from the town of Huancavelica to the Santa Barbara mine is now finished. The road is 21 km. long. Santa Barbara, with large reserves of mercury ore, is now in the process of erecting a large plant.

▶ Banco Minero is building a blast furnace at Callao. The furnace has a capacity of 20 tons and will produce grinding balls and other materials which are at present difficult to obtain because of priorities. The furnace is expected to start production within four months.

▶ Production of Peruvian tungsten seems to be climbing slowly but steadily with the more active development of the mines. There are three regions in Peru which produce tungsten, Pasto Bueno, Mundo Nuevo, and Pellagatos, all in northern Peru, 300 miles north of Lima, inland from Trujillo. The tungsten occurs as wolframite and related minerals, within rather small quartz lenses imbedded in slates. Hence prospects for large-scale operations are not very bright, exploitation being done on a small scale, with hardly any modern mechanical equipment. Banco Minero has ordered several small gravity concentration units, each consisting of a crusher, rod mill, and tables, and will lend them to the small mines to aid in the increase of production.

▶ The United States government, in collaboration with the Peruvian government, has established at least 16, and probably 20, new scholarships for science students and young professionals to go to American universities for one year, which may in certain cases be extended to two years. This move on the part of the United States government has caused an extremely favorable impression in Peru, as it represents a tangible sample of the good will and close co-



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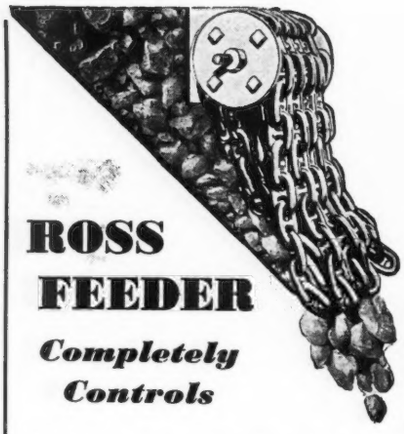

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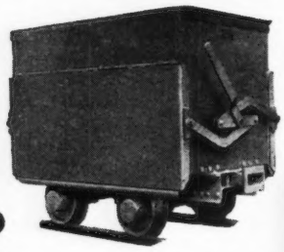

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▶PERU

operation between the Americas. Several young mining engineering students have applied for scholarships.

▶ The well-known firm of A. y F. Wiese, large importers of machinery, has announced the installation in Lima, in the near future, of a copper wire factory. This will be a real aid to industries in general and to the miners in particular, as the shortage of copper wire and the restrictions for the importing of all electrical equipment have affected operations considerably. Electrolytic copper produced by Cerro de Pasco Copper Corp. will be used in the manufacturing of the wire.

BOLIVIA

Government Approves Cooperation With U. S.

National mining congress sanctions international accord; also recommends new mining and labor codes, and tax changes —Compagnie Aramayo completes new diesel unit—Tungsten output not yet up to capacity

▶ During the last fortnight in October the second national mining congress took place in La Paz, with the attendance of representatives of all the associations of large, medium, and small miners, categories in which for legal purposes Bolivian producers are classified. The outstanding resolutions taken in the meetings of an international nature concerned the approval of the policy of Bolivian-North American cooperation for the promotion of the mining and petroleum industries of Bolivia. On the internal side, several recommendations for the new codes of labor and mining that have not yet been approved by the Legislature were made; also for revision of profit and export taxes. Regarding coal, of which no deposits of importance have been discovered as yet, the government has regimented its exploitation through a decree that says: "The deposits of coal and other carbonaceous materials existing in the territory of the Republic are declared a State reserve, their exploitation being an exclusive function of the State." The last sessions of Parliament are being devoted to discussion of the plan for North American cooperation in the development of Bolivian mineral resources and others, like oil, agriculture, etc. The various diplomatic representatives have already made preliminary agreements, and it is expected that within the next few days the several projects will receive the final approval of the governments and be put into effect immediately.

▶ Compagnie Aramayo de Mines en Bolivia has just completed the installation of a new 1,200-hp. diesel engine, which has been added to the Telemayu power plant. Although production has not yet been brought to full plant capacity at Aramayo's Tasna and Pacuni tungsten properties, it is reported to have reached 80 tons fine per month.

AFRICA

Blyvoor Develops Bonanza Ore

Three Rand mines break records—Tano Gold Dredging, Ltd., to liquidate—Western Reefs, Kwahu, and Bushtick doing well

▶ Although totals cannot yet be given, early reports from South Africa indicate that the slight decline in Witwatersrand gold production noted recently has been arrested and that October's output showed improvement. Of the six companies reporting first for October three made new all-time high records of monthly working profits. These three were East Geduld, Grootvlei, and Marievale. The gold output of the Witwatersrand in September was 1,160,541 oz. This was 21,896 oz. less than in August, but the decrease was more than accounted for by September having one less working day. August's daily production was 38,143 oz. and September's 38,684 oz. The number of natives employed, 340,148 at the end of September, was 22,929 fewer than a year previously; but this is largely accounted for by reduced development work and the suspension of activities at a few of the new properties. Rather than to prepare further for the future, the idea now is to produce gold. Much has been expected of this year's October results, as it was in October last year that the high record of all time, 1,235,784 oz., was produced; but delays in the receipt of supplies by the mining companies must have made even a close approach to that record impossible this year.

▶ Blyvoor is continuing to be the sensation of Witwatersrand developments. It has so far opened up some 3½ miles on the Carbon Leader, the new reef it is exploiting, and throughout this considerable area the reef is 100 percent payable. Of this, the values average 3¼ oz. per ton over about one-third, or 8,670 ft. of the openings. Despite the widths averaging something like 14 in., it unquestionably is a bonanza showing, as 50 to 70 percent payability is considered good when the Main Reef is being developed in Witwatersrand mines generally. With its mill of only 8,000 tons a month capacity, it is treating the ore coming from development, supplemented by a small tonnage from stopes, and its working profit in October was £6,317. Its operating costs are high, and because of the narrowness of its reef may be expected to continue so. Ore reserves of Blyvoor are arrived at by taking a stoping width of 45 in. and so computed already are 583,000 tons averaging 15 dwt. per ton, all developed in a little over one year. West Witersrand, which has drilled vast areas and formed several companies, including Blyvoor, is waiting for the end of the war to float another company to develop and work the immediately adjoining ground which is known to carry the Carbon Leader reef.

▶ Western Reefs, a neighbor of Blyvoor but working the Main Reef instead of the Carbon Leader, is only second now in

interest to the mining fraternity. From the beginning of productive activities earlier this year Western Reefs has reported steadily increasing working profits. Its October working profit was £68,559, a new high record, as were those of preceding months. Its profits are being helped by steadily decreasing operating costs.

▶ Rand Leases (Vogelstruisfontein) Gold Mining Co.'s output was restricted in October by an underground fire which broke out in the old workings. It was extinguished in six days, and had done little damage.

▶ Tano Gold Dredging, Ltd., is to be liquidated. This company was formed a few years ago to purchase and work what was then thought to be an important dredging area. It was soon found that the gravel contained much less gold than had been represented. The management put the facts before the shareholders, expressing the belief at the time that the richer portions of the ground would yield some £100,000 of profit. Now the richer areas have been worked out and have yielded some £140,625, which has been returned to the shareholders, and the £82,000 of cash assets which the company has in hand. The plant, including two dredgers, has been sold to Bremang Gold Dredging for 350,000 shares of the latter's stock. These shares and the cash in hand will soon be distributed to Tano shareholders and the company will be dissolved. Bremang Gold Dredging, operating a property close to that of Tano, treated 263,000 yards of gravel in October and recovered 1,621 oz. of gold. The equipment it has acquired from Tano will enable it to increase output appreciably.

▶ Kwahu Mining Co. has declared a dividend of 6d. per share, the first since 1939. For a few years Kwahu had a large income from its holdings of Marlu Gold Mining Areas. Marlu was working a large deposit of oxidized ore and its profits were around £50,000 per month; but this deposit is now nearly exhausted and profit in October was down to £9,571. It was reported some months ago that Marlu was investigating another similar deposit of ore. Whether it is rich enough to work is not yet known.

▶ Bushtick Mines, which owes its existence and operating success to the advance in the price of gold, made a working profit of £84,099 in the year to June 30 last. Net profit was £46,846, against £65,116 the previous year. Higher taxes made a reduction of dividend to 5 5/6 percent necessary. Bushtick has reserves of 601,410 tons of 3.79 dwt. ore. Its production cost is around 97s. per ounce of gold, and the Southern Rhodesia fixed price is 156s.

▶ Captain E. Levett Scrivener, chairman of Tin Fields of Nigeria, Ltd., told shareholders at the meeting recently held in London that the government had taken over control of tin in Nigeria in December, 1941, and requested the companies to increase production to the fullest possible extent. Everything had been and would be done by his company to comply with this request. Dividends of 8½ percent have been paid from the year's earnings.

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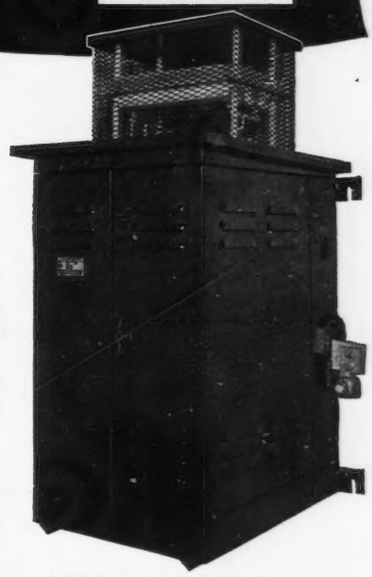

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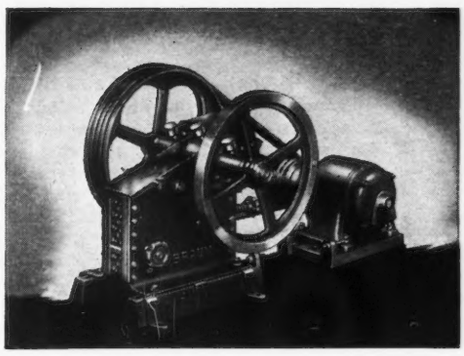

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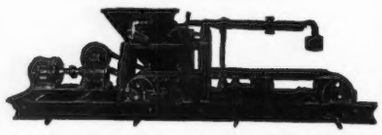

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(*Continued from page* 84)

Tungsten

Arrangements have been made for custom milling of tungsten ores both in Nevada and in Utah, and for the retreatment plant in Utah which will permit the utilization of large tonnages of low grade concentrates, much of which has hitherto not been recovered. Arrangements have been made for direct purchase of tungsten ores and concentrates for small producers on a basis of $24.00 per unit (of 20 lb.). With the above measures domestic tungsten production has more than doubled in the past twelve months.

Defense Plant Corp. has made commitments totaling $868,465 for treatment of tungsten ores.

Vanadium

Metals Reserve Co. has undertaken a program for rapid development of the sandstone ores of western Colorado and eastern Utah, and two new mills are now in operation in this area under agency agreements. A similar program is under way in connection with lead vanadate ores in Nevada. Research is being financed on several additional potential sources of vanadium. It is estimated that with the above steps, production in 1943 will be more than double the 1941 domestic output.

Defense Plant Corp. has authorized commitments totaling $1,260,000 for the production of vanadium and vanadium pentoxide.

Metals Reserve Co. is negotiating or has concluded purchase contracts to establish new production of numerous other strategic and critical materials, such as antimony, beryl, cobalt, and zircon, while Defense Plant Corp. has made commitments of $2,902,000 for the production of beryllium alloy, and $16,765,000 to increase capacity for production of ferrosilicon.

There have been several notable developments in the operating policies of Metals Reserve Co. during recent months, chief among which was the creation of purchasing facilities so that small producers would be encouraged to bring quantities of manganese and chrome ores even as small as wagon and truck loads to buying depots set up at strategic points in mining territories. This step, coupled with the reduction of acceptable ore content wherever feasible and the elimination of certain penalties on low-grade manganese and chrome, has unquestionably stimulated domestic production.

In order to secure the most reliable information as to problems confronting the domestic producer and to obtain the soundest advice as to the manner in which Metals Reserve Co. can assist the domestic producer in dealing with his problems, consultants have been appointed in a number of Western states. The appointees are outstanding men in their communities who are qualified to assist in this program and who have demonstrated an unselfish interest in the welfare of their respective localities.

Attention should be called to the role of Defense Plant Corp. and the exact method by which it has contributed immeasurably to the furtherance of the program. In the past, one of the fundamental obstacles in the way of augmented domestic production has been the lack of private capital to finance the erection of plants needed to beneficiate or process low-grade ore. Securing the necessary capital is no longer a major problem if the prospective producer can establish that he has the ore and a process which will produce substantial amounts of strategic and critical materials, inasmuch as Defense Plant Corp. is empowered to cooperate by acquiring the facilities and leasing them to the prospective producer on a fair basis. Those facilities customarily are owned by Defense Plant Corp. and are either leased for private operation or are operated by private companies for the account of the Government. However, Defense Plant Corp. erects no plants, and enters into no contracts, without the recommendation of the War Production Board, the Army, the Navy, or the Maritime Commission.

To avoid duplicating the efforts of other governmental agencies which maintain specially qualified technical staffs, the RFC has not assumed the initial responsibility for determining the quantity and quality of materials needed in the War program. When the President, the War Production Board, the Army, the Navy, the Maritime Commission, or the Board of Economic Warfare establishes the need for materials or supplies, or plant facilities to produce them, for which no other provision is made, the RFC directly or through its subsidiaries undertakes, upon specific requests, to provide them. In this connection, only tin and manganese were originally recommended for the attention of Metals Reserve Co., and the other strategic and critical materials with which it now concerns itself have been brought within its purview from time to time at the designation of the President or one of the above-mentioned agencies.

Every effort has been made to give the applicants for development loans most liberal consideration. The result is that in the six years since the Corporation was first authorized to make this type of loan, disbursements have amounted to $1,662,100 and repayments to only $144,500.

Under Section 5d of the RFC Act as amended by Public No. 664, 76th Congress, approved June 25, 1940, the RFC had on Oct. 26, 1942, made loans for processing of minerals and metals, defined by the President as strategic and critical, to the extent of $190,700,700. These loans made available to private industry the capital needed to carry on its operations.

Mica Deposits Discovered In New Zealand

DISCOVERY of extensive mica deposits in South Westland, New Zealand, has been confirmed by the Ministry of Mines, the British press reports. Samples of the mica are good, and the deposits appear to be sufficiently important to warrant a detailed survey.

The pegmatites in which the mica occurs are said to exist over an area of 89 square miles, on the rugged crest of Mataketake Range, at elevations from 4,000 to 5,000 ft.

LETTERS

(*Continued from page* 77)

—and this is probably one of the greatest in human history—it requires careful scrutiny and presents infinite difficulties in its realization. I think it was Voltaire who said, "All generalizations are unsafe, including this one."

In engineering and scientific work we proceed from the particular to the general. Thus in metallurgy we go from the test tube to the beaker to the small-scale operation, and finally to the pilot plant, before the big works is constructed and put in operation. Even then we know that there will be plenty of "bugs" to be ironed out before the operation proceeds successfully and without interruption.

But in the fields of social and economic policy, even in national affairs, the contrary procedure seems to be the rule—perhaps it has to be. And in international affairs, so far as has yet been discovered, we must apparently always proceed from the general to the particular.

The hard-headed frontiersman and the great soldier-statesman, Jans Christian Smuts, puts it thus in his recent broadcast from London, "The Atlantic Charter . . . only requires more careful definition and elaboration to become the real Magna Charta of nations."

Article V, however, advocates "securing for all, improved labor standards, economic advancement, and social security." The reconciliation of these two articles will call for wisdom and patience greater than the world has ever seen exemplified in international relations. If improved labor standards, economic advancement, and social security are to be achieved, without reducing the standards in the more progressive countries, full equality of access to the world's raw materials and trade can be granted only when and if the beneficiary country succeeds in establishing comparable living conditions, with all that this implies.

Now, as you have pointed out, the first three freedoms are undebatable and are accepted in principle by all right-thinking men. But the fourth article, . . . access on equal terms to the trade and raw materials of the world," if taken literally, means free trade and nothing else. However, there are some loopholes. "They will endeavor with due respect for their existing obligations to further the enjoyment . . ." dilutes the guarantee to a notable degree. It indeed constitutes an "escape clause," which will undoubtedly have to be utilized so far as the United States is concerned. Otherwise, the scale of living and of wages will inevitably gravitate downward to a general world level.

For illustration: a mining engineer recently returned from India reports that 60 percent ore for the blast furnaces of the Tata Iron Works is mined by hand and delivered (by women carriers) into railroad cars for 16¢ a ton—also that the total reserves of iron ore in this part of India are of the order of 3,000,000,000 tons of metallic iron.

The implications of such a situation are obvious, and it is not only the industrialists who will object to anything faintly approaching free trade. Organized labor and the farmer as soon as they see the light will roar to high heaven in protest against anything of this sort—and the administration will have to give heed.

General Smuts, who chooses his words with great care, doubtless included the qualifying "only" as a gesture of courtesy to the British Prime Minister, in whose presence he was speaking.

Without "more careful definition and elaboration," and, one may add, limitation, the fourth article of the Charter, if any attempt should be made to put it into effect in the post-war program, would cause an uproar in the United States such as has never been heard in our entire history. Much the same thing I imagine would be true in Britain.

Isolationism is dead—America must henceforth assume her rightful position of world leadership whether she likes it or not. But we are not going to jump out of the frying pan into the fire.

FRANCIS A. THOMSON

Butte, Montana

Magnetite in Copper Matte

The Editor:

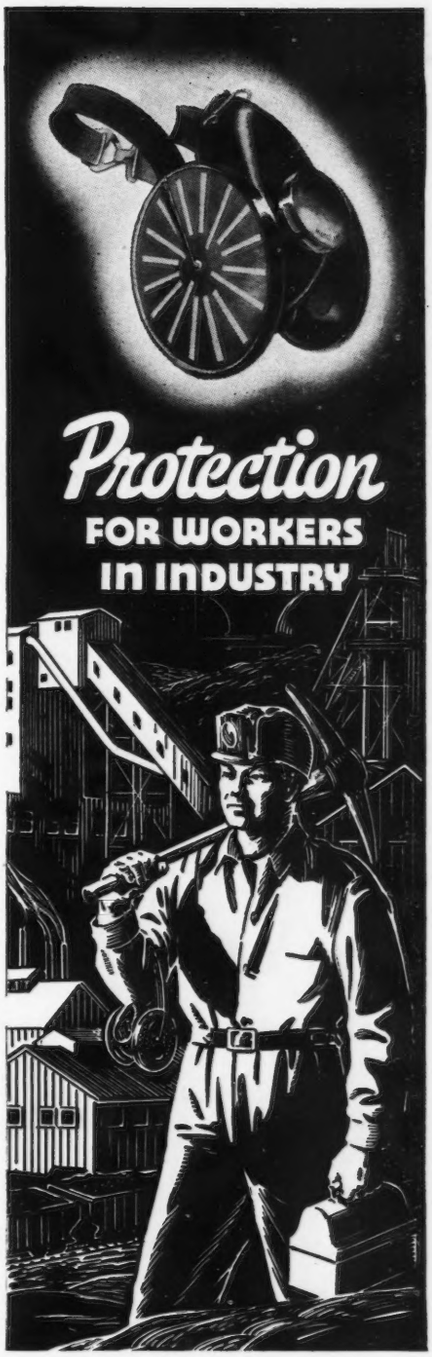
A RECENT COMMUNICATION (*E.&M.J.,Sept.* 1942) pointed out a few facts regarding copper in slags. There are other conditions in the reverberatory smelting of copper that may be considered.

It has been observed and authenticated that as long as there is unsmelted charge in the reverberatory the burning fuel works on that charge and there is practically no decrease in efficiency resulting from redistribution of the charge.

It has been observed that magnetite accumulates in the bottom of furnaces and that this accumulation occurs mostly at the skimming end of the furnace. I pointed out (*Ind. & Eng.Chem.*, 1930, p.970) that the tendency towards the formation of magnetite in these smelting operations was very great and that its control and elimination as a problem was not easy.

Mattes tapped usually contain magnetite. Hawley (*E.&M.J.-W.*1931,p. 270) presents figures showing magnetite content of mattes of 4.6 percent to 17.8 percent. This magnetite is a circulating load. It goes to the converter and returns to the reverberatory in the converter slag, which is mostly nowadays charged liquid into the reverberatory. This magnetite may limit the converter operation. It furnishes no heat and does not flux. I might state parenthetically that the chemistry of mattes at high temperatures is but little known, although thousands of tons of this important material are made every day. For example, magnetite is reducible by FeS at sufficiently high temperatures, yielding ferrous oxide. Is ferrous oxide miscible in mattes and to what extent? What are the partition coefficients of FeO between mattes and slags? An important question for experimental laboratory study, and there are many other questions too.

The accumulation of magnetite in the matte and in the bottom of the furnace at its skimming end may be owing to two factors. First the mechanics of



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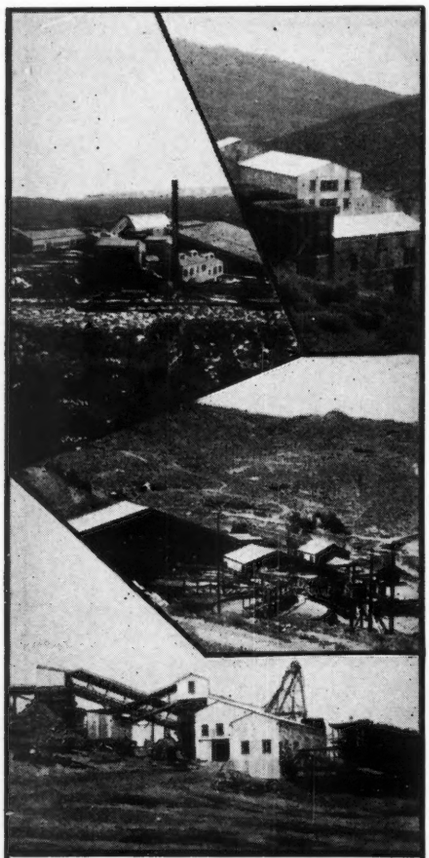

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skimming can carry it along in the molten flow of material which is away from the hot end of the furnace. Second, the temperature for reduction at the skimming end of the magnetite by iron sulphide is too low. This reduction appears to require temperatures of upwards of 2,300 deg. F. where the magnetite and sulphide are, not just in the gases above.

The charging of converter slag with its load of magnetite is usually at the firing end of the reverberatory (where the temperature is higher) in the hope of achieving reduction of the magnetite and proper slagging of the iron. Because the temperature at this end of the furnace is higher, this point or place of charging converter slag appears logical. However, the reducing material (FeS) is not usually readily present here in sufficient amount to give reduction. If it were there would not be a magnetite problem. The logic of the operation should be to provide adequate reduction at the hot end of the reverberatory. It is quite possible that such a provision cannot be installed in many existing layouts and it is suggested that to this extent such plants are less than ideal.

The logic of the operation for control of magnetite points to removal of both slag and matte from the hottest end of the furnace. At this end, it is suggested, both matte and slag could be tapped into a settler outside of the furnace. Possibly in some plants converter slag might be treated in such a settler, although more reduction, mixing, and cleaning should be obtained by treating converter slag in the furnace and treating the resulting slag mixture in an outside settler. The slag would be hotter and more fluid, and better and more rapid settling should occur. Slag treated in a settler should plunge into a bath of matte at as high a temperature as possible. It is believed that the furnace efficiency would be no lower and might be higher than with present usual operation.

After all, usual present-day operation is an outgrowth of earlier experience and work which was found feasible and has not been too seriously questioned.

A. C. HALFERDAHL

Rockcliffe Park, Ottawa, Ont.

Current Conditions in Durango

The Editor:

DURANGO has been a considerable mining center in the past, but the late revolution closed all the mines. In June 1913 the city was looted and partly burned, and since then the surface equipment of the mines has been carried away and sold for scrap iron. There has been but little recovery. All available local capital has been required to rebuild the city and towns. Durango City is now well paved, clean, and well supplied with water and electricity.

Many of the silver mines produced lead, zinc, and copper and could be made to produce the base metals now. Avino was found in 1556 and worked extensively by the Spaniards and last by the English. It was first a silver-lead mine. The lead was replaced by zinc and the latter by copper. It could be made to produce copper, silver, and gold now. The smaller mines are in the same condition.

Some remarkable cinnabar (mercury) mines have been found lately. It has been possible to work these mines with very little capital and to build them up with their own profits. A few sections of gas or water pipe used as retorts, and a ready sale for the mercury, make the operation profitable even if only half of the mercury is recovered. One such enterprise is now producing over a hundred flasks of quicksilver per month.

Some tin has been produced in this neighborhood for many years. Just now it is attracting considerable attention. There is a small hard-rock and a placer operation now in the edge of the city. Tin is found in all directions from the city, the best-known region being known as America, about 60 miles north, where the production is 50 tons per month of cassiterite. Production is entirely by hand, and the only investment is in shovels and an occasional wheelbarrow. Two small furnaces are operating in the city, but most of the ore goes to San Luis Potosi. In 1881–82 two attempts to produce tin were made by American companies, but they were not profitable. Tin was then worth 8c. per pound. Now it brings over a dollar on the ground.

In the edge of the city is a large iron mine shipping over one hundred tons per day. There is also some production of antimony.

Less than a year ago a very large deposit of manganese was discovered, but only in the last few months has title been acquired to it and enough work done to prove its extent. The orebody is 125 ft. wide and outcrops in several places for a distance of three miles. It is much larger and richer than any manganese in the United States.

There is no rubber factory in Durango to treat the guayule that grows in abundance in certain sections. Some forty years ago there was a production of tree rubber from the western part of the State, but this stopped when the price became too low. About the same time there was a boom on in rubber and coffee on the isthmus of Tehuantepec. Thousands of rubber trees were set out with the expectation of setting coffee later, because coffee only grows in the shade. They are there yet, practically wild.

Mexico depends on the United States for a market, and for capital and equipment. The mercury produced now is hoisted by hand and distilled in crude retorts. The tin is washed in bateas and on planillas. Manganese has not had a thousand dollars spent on its development.

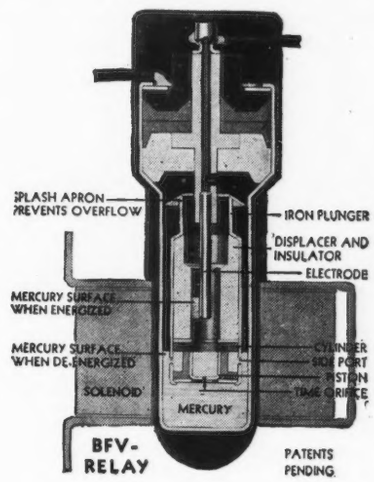
One handicap now is slow mail. It takes three weeks to get an answer to letters to any large American city. One can reach New Orleans from Durango in one day by air and two by rail and bus, but a letter takes from eight to ten days air mail. Sometimes it is routed a thousand miles out of the way, but most of the time is lost by the censor. Letters from Chicago take eight days where they used to take four. Even telegrams are delayed. One came back to me asking what kind of tin and what kind of manganese it was proposed to mine. It would seem that with Mexico in the same war as the United States, a censorship would not be required.

Durango, Mexico H. H. TAFT.

EQUIPMENT NEWS

Time-Delay Relay

WHEREVER TIME INTERVALS are required at the beginning or end of a cycle, also in recycling or flasher actions, the Series BFV Durakool Timer, finds application. An instrument well adapted to modern communications systems, machines, motors, and electrical circuits, the BFV Series provides slow-closing, quick-opening, and instant reset of con-



tact using a single-relay unit, as well as slow-closing, slow-opening contacts and quick-closing, slow-opening contacts.

To keep time-delay settings accurate, it is important that no burning apart of contacts occur, as this changes the time setting. By introducing a non-oxidizing pressure atmosphere of inert gas, flaming in the relay is eliminated and time settings remain constant. Because this high-pressure gas cools and quenches arcing, these relays are recommended wherever dust, dirt, moisure, and explosive fumes present hazards to electrical contacts. Capacities up to 75 amp. are available with solenoids wound for any voltage or frequency. Durakool, Inc., Elkhart, Ind., the manufacturer, also produces metal-bodied tilting mercury switches which have found wide application in various mill-control devices.

Full-vision Mask

DESIGNED FOR FULL PROTECTION against smoke, carbon monoxide, ammonia, and other gases up to certain maximum concentrations, the new Bureau of Mines approved gas mask of Acme Protection Equipment Co., Pittsburgh, Pa., features a comfortable, full-vision mask which aids the wearer in obtaining complete freedom of movement with safety while using it. The mask includes a dead-air valve which eliminates air expelled from the lungs and prevents re-breathing of any part of the purified air entering the device. An automatic timer placed on the canister indicates to the wearer the length of time remaining in which the mask will protect him.

Motor Selector Chart

TO HELP MOTOR USERS to fill their wartime motor needs with the least possible delay and in conformity with the latest WPB recommendations, Allis-Chalmers Mfg. Co., Milwaukee, Wis., has available for free distribution a Motor-Finder chart which rapidly indicates the type of squirrel-cage motor best suited to the user's particular installation. Thirty standard types covering a range of from ½ to 75 hp. are included in the chart, and full consideration is given to the squirrel-cage motor's wide versatility. Operating conditions are matched with desired characteristics by an application of the slide-rule principle, and the correct motor selection is easily made. Copies of the slide-rule can be obtained by applying to the company.

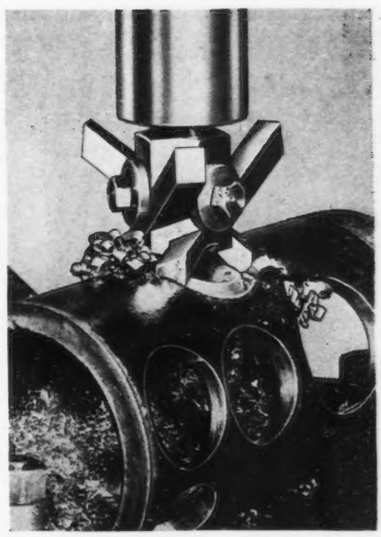
Protective Skin Cream

CLEANING ONE'S HANDS after a shift in a copper flotation mill, a manganese mine, or after any sort of general repair work can be troublesome, particularly if strong abrasive soaps are used day after day. A possible solution to this problem is presented in the form of a water-soluble skin cream which is said to protect the hands against grease, paint, dust, or other injurious substances. Supplied by Mitts Manufacturing Co., Brooklyn, N. Y., the preparation is applied to the hands before starting work, is said to form an invisible nonsticky, protective coating, and to be easily removable thereafter by washing, carrying dirt along with it. Ordinary industrial skin troubles are also said to be inhibited by use of this product.

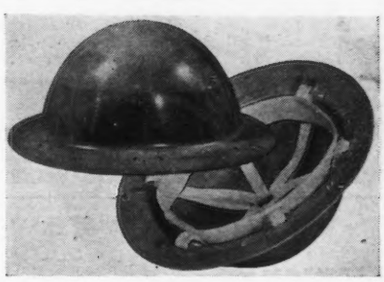
Drafting Room Aid

BLUE-PRINTS, drawings, and tracing paper in any width up to 55 in. can be readily trimmed squarely to size almost instantaneously by use of the new Edi paper trimmer sold by Edi Trimming Machines, 609 W. 115th St., New York, N. Y. Several thicknesses

of paper can be cut simultaneously if desired, and accurate margins around the drawing frame can be easily obtained. Operation of the machine is shown in the accompanying illustration. Information on sizes and prices can be obtained from the maker.



Demonstrating the action of the new Clark adjustable three-bladed hole cutter which is designed for use in all types of drilling or general shop equipment. Clean holes from ¾ in. to 4½ in. can be cut. The tool is manufactured by Robert H. Clark Co., Los Angeles, Calif.



The new safety hat of laminated bakelite made by B. F. McDonald Co., Los Angeles, Calif., which replaces that company's type "T" metal hat. Features of the new hat are lightness, strength, and adjustability to all head sizes.

Transformer Type Welder

EXCEPTIONAL SAFETY with improved operating efficiency is claimed for the new a.c. transformer-type welding machine announced by Wilson Welder & Metals Co., Inc., New York, N. Y. Recent improvements make possible a low open circuit voltage of 42 volts, which, with power factor correction and a new wiring arrangement, conserves power and reduces costs. Total open circuit voltage is 85 volts, which is produced by automatically cutting in a second coil when the machine begins operating. Dual voltage connections for 220 or 440 volts are provided, and a single-hand wheel gives an infinite number of current adjustments throughout the NEMA range.

Simplified Standards on Wire Rope

A PROPOSED SIMPLIFIED PRACTICE recommendation for wire rope has been submitted by the Bureau of Standards to producers, distributors, users, and others who may be interested for approval or comment. The recom-

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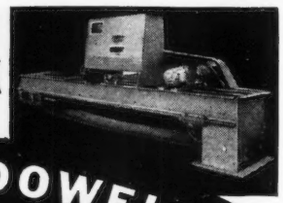

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Where control of feed improves efficiency—as in weighing feed of ores to ball mills—the Merrick FEEDOWEIGHT gives perfect results. Weighs and Regulates separately. Continuously totalizes weight. Gives better control of grind. Used and approved by leading mill properties. Simple—rugged—"foolproof."

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BULLETIN 551 FOR DATA

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mendation is designed to conserve material and productive capacity for the war program, and at the same time meet consumer requirements. It includes sizes, constructions, grades, and breaking strengths of the vast majority of wire rope and is based on exhaustive analysis of existing published standards in the industry.

General adherence to the recommendation will result in a reduction in variety from 973 items to 643, or 33.9 percent. The major production and use of wire rope, and consequently the predominant tonnage, is covered by four different rope constructions, where the proposed reduction in variety is from 352 items to 182, or 48 percent. Further information can be obtained from the Division of Simplified Practice, Bureau of Standards, Washington, D. C.

INDUSTRIAL NOTES

Army-Navy "E" awards for excellence in the production of war materials have recently been given to **Leeds & Northrup Co.**, Philadelphia, Pa.; **Bucyrus-Erie Co.**, South Milwaukee, Wis.; **Owens-Corning Fiberglas Corp.**, Newark, Ohio. A **Maritime Commission "M"** has been awarded to **Homestead Valve Mfg. Co.**, Coraopolis, Pa.

Hersey & Co., Inc., Seattle, Wash., manufacturers of large-diameter flexible ventilating hose, announced that, effective Nov. 2, 1942, the company name had been changed to **American Ventilating Hose Co.**

All Canadian distribution of P&H welders and electrodes, manufactured by **Harnischfeger Corp.**, Milwaukee, Wis., is now being handled by **Canadian Fairbanks-Morse Co.**, Ltd.

Sauerman Bros., Inc., Chicago, Ill., manufacturers of long-range material-handling equipment, announce the appointment of **J. R. Norton**, 11 W. 42d St., New York, N. Y., as distributor to succeed W. R. Elden, who died recently. Mr. Norton is well known to buyers of construction and mining machinery in the New York district, where he has maintained a sales office for many years.

T. D. Davis, formerly West Coast service engineer in the crusher division of **Nordberg Mfg. Co.**, has been made district representative for the Pacific Coast territory, with headquarters at 667 Subway Terminal Bldg., Los Angeles, Calif.

General Electric Co. announces that **D. L. Beeman** has been appointed engineer of the industrial power section of the company, and **R. S. Sage** has been named engineer of the mining section. **E. G. Merrick** and **F. L. Stone**, who formerly held these positions, will continue with the company as engineering consultants.

William Salt, for many years head of the service department of **De Laval Steam Turbine Co.**, Trenton, N. J., died on Saturday, Oct. 31, 1942. Mr. Salt had been associated with the company for more than forty years.

Taylor-Wharton Iron & Steel Co., High Bridge, N. J., manufacturers of a wide variety of manganese steel mining and excavating equipment, celebrated on Oct. 17, the 200th anniversary of the founding of the company.

LeTourneau Co. of Georgia dedicated its new Vicksburg, Miss., plant on Nov. 28. A new bomber crane, a land battleship, and other LeTourneau equipment were on display at that time.

Allis-Chalmers Co., Milwaukee, Wis., has appointed **Selden H. Gorham** as manager of dealer sales supervising approximately 400 dealers throughout the country.

Universal Crusher Co., Cedar Rapids, Iowa, announces that it has changed its corporate name to **Universal Engineering Co.** The new title was felt to be more in keeping with the expanded activities of the organization. Nothing will be eliminated, however, from the line of crushing equipment manufactured by the firm.

E. P. Barry has been appointed coordinator of plants for **Chicago Pneumatic Tool Co.**, to supervise machine equipment and tool designing methods at its four plants, located at Detroit, Cleveland, Franklin, Pa., and Garfield, N. J.

Frank J. Kevlin has recently been appointed traffic manager of **Falk Corporation, Milwaukee, Wis.**

Reflections From Washington

(*Continued from page* 46)

Generally speaking, OPA's moves fall into one of three general classes. One group of orders establishes a price that the government will pay for idle stocks of metal frozen by WPB action. Another group enables Metals Reserve Co. to operate without a price ceiling in the purchase of imported ores which are resold on the domestic market under price ceilings. The third type of order changes the domestic price ceiling to stimulate domestic production or changes the price at which Metals Reserve Co. can buy a metal that is resold under the prevailing price ceiling.

Examples of all three types of transactions occurred during the last month. The price at which iridium, its alloys and scrap, is to be purchased by Metals Reserve Co. from owners in whose hands it has been frozen was set at $140 per troy ounce for contained iridium f.o.b. Bureau of Standards, Washington, D. C.; for palladium $18, and other precious metals $32 per contained troy ounce. The order set certain penalties and names Baker & Co., Inc., Newark, N. J., MRC's agent in buying iridium scrap.

A maximum export premium of $6 per gross ton was established on export sales of chrome ores and concentrates of 38 to 44 percent chromic oxide content. This action reconciles Metal Reserve's price on foreign sales

and the price foreign buyers pay for foreign ores of the same grade.

Domestic ceilings on chrome ores were set to stabilize ore costs of producers of ferrochromium, chromium chemicals, and chromium refractory products. This sets a ceiling price on sales by the government (Metals Reserve Co.), but it permits Metals Reserve to purchase at any price deemed necessary to get the desired domestic production and imports.

The maximum price of metallurgical fluorspar was raised to a new base ranging from $25 to $28 per short ton from a previous price ranging from $23 to $25 per short ton, depending upon the calcium fluoride and silica contents. This move makes it economically possible to open up high-cost operations and to carry out the development work that must be done if production in this country is to be increased.

Metals Reserve announced that until the end of next year the price it will pay for tungsten ores and concentrates purchased from "eligible producers" and "new producers" will be raised $6 per short ton from the previous base of $24. This takes in all domestic producers that got out less than 100 short tons of tungsten trioxide in 1941. The price change has been made in an effort to get the smaller producers to increase their output.

The ceiling prices for metallurgical manganese ore which were recently established do not affect the prices at which domestic ores will be purchased by Metals Reserve Co. The ceiling prices that went into effect on Nov. 9 are 85c. per long ton unit of contained manganese (on 48 percent ore) f.o.b. cars Mobile and New Orleans; 90c. f.o.b. Norfolk, Baltimore, Philadelphia and New York; 96c. at Fontana, Calif, Pueblo, Colo., and Provo, Utah. Exemptions are sales to the United States government and its agencies and sales or deliveries outside of continental United States of purchases f.o.b. a foreign point.

OPA has ruled that the 3 percent transportation tax, effective Dec. 1, must be treated as a freight rate increase, which cannot be passed on to disturb ceiling prices.

Housing for Miners

AS A STEP toward making work in Western mine fields more attractive, the National Housing Agency has allocated $6,000,000 for construction of 2,000 dwelling units for non-ferrous metal miners in seven Western states, and WPB has granted blanket priority for the materials.

NHA acted upon the request of the War Manpower Commission and the War Department, which recommended alleviation of critical housing shortages that threatened to interfere with production.

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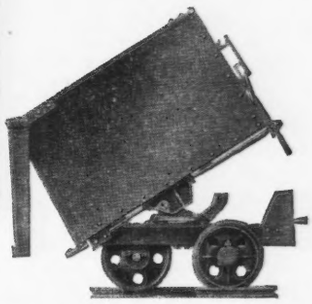
ARE DOING THEIR JOB FAITHFULLY & CONTINUOUSLY IN METAL MINES Everywhere!



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Maximum speed in your haulage operations is absolutely essential to maintain uninterrupted flow of war materials. Keep your production on the march with PSC Cars—correctly designed and built to stand up under 24-hour continuous service with minimum time-outs for maintenance.

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Here's haulage efficiency that answers the need for a storage battery locomotive between the 1½ ton and 3 ton types . . . the ATLAS 2½ ton type "K". It embodies all the engineering and design experience acquired in 45 years of building metal mine haulage equipment. Anti-friction bearings throughout . . . spur gear drive . . . are a few of the features that mark the ATLAS type "K" battery locomotive. With your operations at a maximum, the type "K" can be of great value to you. Write, and we'll forward details on this and other ATLAS storage battery locomotives and haulage equipment.

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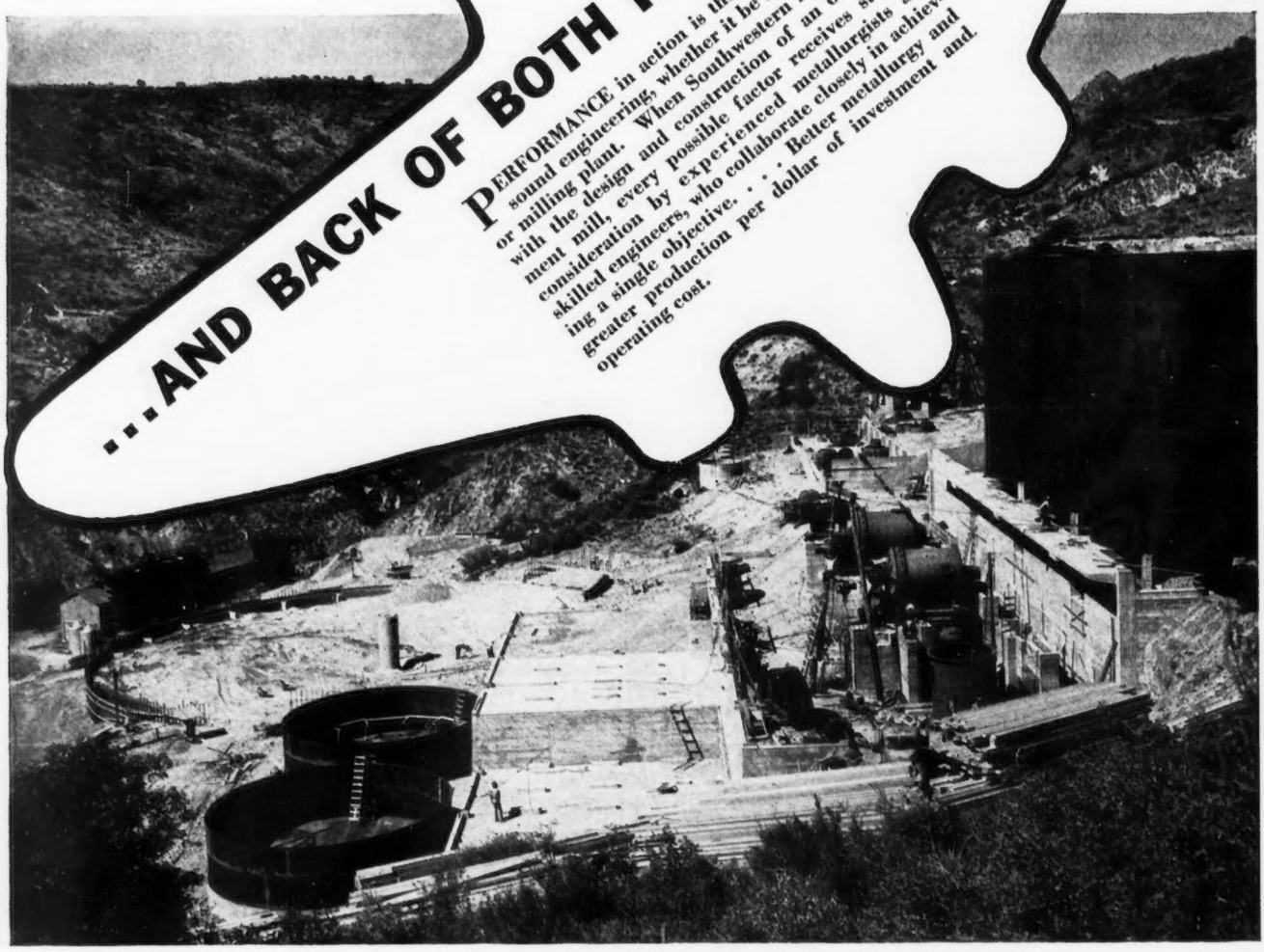

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What Can I Do?

EVER SINCE that Sunday morning when havoc swooped from the skies upon Honolulu, a new question has been churning about in millions of American minds. It is this: What can I do to help my country win this war?

This insistent question has pushed aside all matters of personal interest. From now on, individual wants and wishes must give way to the paramount needs of the nation. We all accept that. We have undertaken a huge job. Or, I should say, we have had a huge job thrust upon us. And unless we see that job through successfully it won't much matter what any of us may want.

That job is to win this war.

No longer are we trying to prepare for a war that we may get into. Today we are trying to win a war we're already in—and in up to our eyes. Nothing that any one of us now can do to help himself can get him very much if it does not also help our country to win this war.

I am sure that those who read these words will find many things to do. Some will enlist in the armed services. Some will become active in civilian defense. Some will labor to relieve distress in their home towns. Some will work with organizations set up to serve the men at the front. Each can and will find something he can do.

But this insistent question "What can I do?" goes beyond the individual and his personal service. It re-echoes through the offices and the shops of every American business concern. And what I have to say here is not directed toward individual effort. Rather is it intended for the men and women of American industry who make that industry a living part of American life. Today they are asking themselves: What can industry do? Or better still, what *must* industry do if our country is to finish the job it has started?

Those of us who work in and with American industry have one supreme obligation. We may feel very patriotic; we may be willing to serve "in any capacity;" we may be willing to sacrifice . . . if necessary. But if we fail to meet that one obligation, we shall fail our country in its time of need.

THAT SUPREME OBLIGATION IS AN HONEST DAY'S WORK, EVERY DAY, FROM EVERY MAN, EVERY WOMAN, EVERY MACHINE. . . .

IT IS AS SIMPLE AS THAT!

And that goes for all of us, whether we are engaged in civilian production or working directly on the weapons of war. American victory can be won only through the productivity of American industry.

Efficiency in production is not the responsibility of a few. It can be achieved only as we all put to useful purpose every minute of our time, every ounce of our energy, and every pound of our materials.

This responsibility of industry is the more vital because of what has happened to the business of making war. There was a time when success in war was chiefly a matter of well-trained, well-disciplined armies and competent leaders—when men were everything. In those days, military strength was a matter of strong battalions and able generals. Both still are vital. But today military might is essentially mechanical might. Modern war is an industry just as much as a factory or a railroad. In the first World War, mechanical equipment was relatively simple and limited. But today the special equipment of war and the expert skill needed to use it spell the difference between victory and defeat.

We Americans are not expert war-makers. That is why we must expect to suffer grievous losses before we can win substantial gains. We do not have military training and experience ready to hand when we need them. Neither do we have, ready for action, enough of the machines that are so essential to modern warfare.

So, when it becomes necessary to fight for our lives, we must start from scratch. And today, after a year's effort, we still are not ready to trade blow for blow with enemies who for years have schooled their leaders, trained and disciplined their people, and organized their industries to make war. We shall need more time to develop our strength. And while we are doing that, we must expect reverses.

But there is a brighter side to all this. For it follows that if we are granted this all-important time, the change in the method of warfare is right down our alley. The greater importance of mechanized equipment plays straight into the hand of the world's greatest industrial nation . . . if there is one thing America does know, it is industrial production! Our industries know how to produce. They have the skilled manpower. They have the organized facilities. Beyond any doubt, we can produce all that we need to win the victory that we *must* win—if only we are given the time.

THE FIRST RESPONSIBILITY OF THE ARMED FORCES IS TO GAIN THAT TIME FOR US.

THE FIRST RESPONSIBILITY OF INDUSTRY IS TO USE TO THE FULL EVERY SECOND OF THAT TIME IN PRODUCING THE WEAPONS

THE ARMED FORCES NEED TO WIN THE ULTIMATE VICTORY. INDUSTRIAL PRODUCTION IS THE KEY TO VICTORY. BUT IT MUST BE BIGGER PRODUCTION AND FASTER PRODUCTION THAN WE EVER HAVE KNOWN.

Heretofore American industry has worked to produce more of those things which make our lives more enjoyable. Today it must divert much of its energy from the products of peace to the weapons of war.

This change sets up a new yardstick of industrial performance. In time of peace we measure production efficiency in terms of money saved. From now on, we must measure efficiency chiefly in terms of time saved. For the plane, the tank, the gun, or the ship that is ready when it is needed to win a victory, is worth a million times more than the one that is delivered too late to avert a defeat.

Everyone knows how short we are of some materials and machines. But our most tragic shortage is the shortage of time. So whatever we may waste in the days ahead—and unhappily we are bound to waste plenty—let us never forget that the most deadly waste of all is the waste of time.

Time wasted never can be replaced. No one ever has discovered a substitute for time. If we would avoid the waste of this irreplaceable ingredient of victory, we must use every minute of it effectively—*while we still have it.*

That goes for us all. It goes for the man or the woman at the bench, at the desk, at the counter, in the field, or in the executive office. It goes for the politician as well as for the business man. It goes for the humblest and the most powerful. A nation at war cannot carry deadheads. It cannot spare a square foot for any one who will not pull his weight.

In this war, nothing short of complete victory can save the liberties of us all, rich and poor, employer and employee, haves and have-nots alike. The price of that victory is the labor, the loyalty, and the devotion of every last one of us. Winston Churchill said it well for the British people. You know how he said it. I need not repeat it.

All this imposes upon American industry, its owners, its managers, and its workers, the gravest responsibility they ever have assumed. If our country is to survive as a free nation, American industry must rise to that responsibility. If our country should fall, it would fall because American industry fell short of the need. It would be another case of "too little and too late".

This grave responsibility calls for the keenest management industry ever has known. It calls for unremitting research to make the most of our resources. It calls for the reduction of waste to a record minimum: that goes for waste of time, labor, and material. It calls for keeping our machinery working as near to full capacity as we can contrive. It calls for the highest rates of unit production we ever have known. That will mean skillful coordination by management and the most intelligent cooperation that the men in the shops can give. It calls for inventive ingenuity to match that of a nation which has produced some of the world's outstanding technical genius. For this is a war of technical proficiency.

But above all, it calls for a new devotion to the day's work. For so long as we are at war, the day's work will determine our country's security.

Whatever may be our material resources and our technical skill, however resourceful our management, however broad the scale of our effort, industry cannot measure up to its prodigious responsibility if any of us shirk the day's work. Right there is where we find the one thing we *all* can do—the one thing that is within the power of each of us.

THAT ONE THING IS SIMPLY TO DELIVER AN HONEST DAY'S WORK WHEREVER WE ARE CALLED TO SERVE. HONEST WORK WILL WIN THIS WAR. LOAFING WILL LOSE IT. THE SHOWDOWN WILL BE WHETHER HITLER CAN DRIVE HIS PEOPLE TO WORK HARDER THAN WE ARE WILLING TO WORK. THERE IS NO ONE TO DRIVE US. WE MUST DRIVE OURSELVES!

Is that so much to ask? It is all our country asks of us, the men of industry. It is all that the men who must work the guns and tanks in the field ask of us. It is all that the men who work our ships and our planes ask of us. "Give us the planes, the guns, the ships, the tanks, and all the rest of our tools," they tell us, "and we'll give you the victory that means so much to us all. But, in the name of that victory, give them to us quickly—QUICKLY—QUICKLY!"

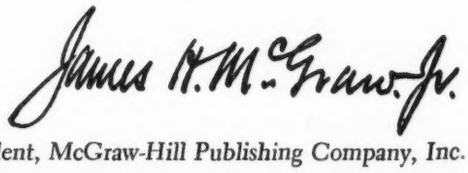
Is that, I repeat, too much to ask of us?

* * * *

To help American industry achieve ever-higher standards of efficiency has been the traditional mission of McGraw-Hill for three-quarters of a century. Normally that effort has been directed toward higher efficiency in the business of peace. But, as in the first World War, twenty-five years ago, it now is directed toward efficiency in the business of war and in every department of American effort that can contribute, directly or indirectly, to the achievement of victory.

And to that mission, I here pledge every resource of this company, its publications, its books, its staff, and every service it is qualified by experience and training to render to American industry, now enlisted in our common cause.

That is what we of McGraw-Hill can do. And that is what we *shall* do to our utmost.



President, McGraw-Hill Publishing Company, Inc.

This message is appearing in all McGraw-Hill industrial and business publications, reaching over a million readers.

"Ten Silver Months . . ."

"EVERY WEAPON *we make today is worth ten that we might produce next year; for this year – 1942 – is the critical year in the existence of the United States.*"

This grim challenge was thrown at American industry by Donald Nelson in his first speech as chief of the War Production Board. He was speaking to a group of business paper editors, called together to receive at first hand Mr. Nelson's urgent message to the industries they serve.

"We've wasted the golden months", he declared, "the months in which we could have expanded our steel industry, our chemical industry, our copper industry, and all the others, so that we would have plenty of everything. But we still have ten silver months – the months that remain in 1942–and in them we can do things that we never thought possible."

To that objective Mr. Nelson has dedicated his high talents and boundless energy. And to that task he asks American industry to apply the full measure of its resources and skill.

That challenge should be all that it takes to exact from industry the last ounce of its energies. For by now we all can see that in this war the American way of life is at stake. American industry is the essence of the American way of life. Neither can survive without the other. So, even if it had no better reason, industry must go all out to win this war as a measure of self-preservation. Here self-interest and patriotic duty are synonymous. American industry cannot afford to let America lose this war.

The 1942 job is crucial. If it is well done we have a chance to win. If it is badly done we cannot possibly win. There is the measure of the responsibility that now rests upon the shoulders of industrial management.

It is not just Donald Nelson who asks this of industry. He speaks for the millions of fighting men – on land, at sea, in the air – the world over, whose eyes turn so desperately to the workshops of America. There and there alone can they see the hope of victory.

The people of America are not going to let those men down. They demand of industry every effort and every sacrifice that may be necessary to back them up. On that score, American industry stands, of necessity, on trial before our people. It must come through – or else!

* * *

As industry goes all out to meet this demand, its management asks of those who set its tasks and supervise its performance the utmost possible cooperation. It asks of them specifically an understanding of its problems and a chance to work them out without unnecessary interference. It asks for protection against attack from the rear while it concentrates its energies against the common foe. It asks a truce on economic reforms and social experiments that have nothing to do with winning the war and that are bound to arouse misgiving and mistrust amongst the proprietors of industry. Above all, it asks that it be not made a political scapegoat for every deficiency that is sure to develop in the confusion of a war effort.

This does not mean that industry resents honest criticism or constructive direction. Neither does it mean that it is unwilling to do its best unless it can have its own way in all things. The managers of industry are practical men. They know better than anyone else that unprecedented conditions call for new methods, that they must be open-minded to every criticism sincerely directed toward winning the victory. They know that no one can afford to be smug in the face of a national crisis.

There would be no point to my rehearsing here the pros and cons of such criticisms. Time is too short for that. Only in its performance can industry write a convincing answer to its critics. But as a help toward the achievement of that performance, I should like to clear up, if I can, one prolific source of misunderstanding and mistrust.

I refer to the solicitude of industrial managers as to where their companies may find themselves after the war. *This concern for the future sometimes is misinterpreted to mean that management is blind to the urgency of the present. But it does not mean that. It is a perfectly natural anxiety that must be felt by any responsible management operating under the American enterprise system – which is one of the things we are fighting to preserve.*

Under our system, the managers of industry cannot but feel a sense of responsibility to its owners, not merely for current dividends on their investments but also for the conservation of their properties. That means they must feel some concern over what may happen after the war to a business that now must go all out to help win the war. And their concern is but part of a general concern over what may be the effect of the war on the whole American way of life, preservation of which is our reason for being at war.

To give practical effect to that concern under present conditions is one of the problems of management. It is not an insuperable problem. Competent management will be able to surmount it, I am sure. But the right kind of help from those in authority can make the job a lot easier. And let us note in passing that the problem cannot be written off, as some critics of business seem to think, merely by setting off against it the profits that business can make on war contracts. That misses the whole point.

For a business enterprise is not, as many seem to think, just a "profit-machine." It is not set up and operated by its owners and managers for the sake of this month's or this year's profits, without regard to any other consideration.

The fact is that any worth-while business must operate as a going concern. It consists not only of stockholders and managers, but also of employees, markets, distributors, and dealers. Mostly, I might say, of markets, distributors, and dealers. They are the "reason for being" of any business, the source of its payrolls and its profits.

No competent management wants to scrap such essential elements of its business just for the sake of war-bred profits, however large they might look . . . at the moment. Most of the original reluctance to get into arms production, for which industry has been criticized, was not due to a "greed for profits", as has been charged. Rather did it arise from management's mistrust of "war profits" that can be made only by sacrificing the essential elements of a healthy business.

* * *

But now industry faces a dire national emergency. The survival of our country and all its institutions – including American business–is at stake. So management must shape its course to meet without stint every need of the war

effort. That means it must subordinate to that effort every other concern. To lose the war is to lose all. We must first win the war if we would save anything.

To the men of management that presents a grave responsibility. It is fair to ask whether government can do anything to help them meet it. One simple thing I think government can and should do. It cannot dissolve all the concerns of management, but it can help substantially.

Government should do all it can to help management conserve those assets of business that will contribute to post-war reconstruction, when that can be done without prejudice to getting on with the war.

Let me explain. Broadly speaking, every business comprises three elements. One is its tangible assets — its factories, machinery, equipment, and materials. Another is its productive capacity — its management, organization, trained working force. A third is its intangible assets — the goodwill, familiarity, acceptance, and recognition that it enjoys amongst its dealers, customers, and prospective customers.

When the nation goes to war government becomes the one dominant customer of a business. Of these three elements, the first two — plant facilities and organization — become of paramount importance to the job in hand. But so far as the government buyer is concerned, the third drops to minor importance.

But that third element cannot be ignored by the managers responsible for that business. For it will be their mainstay when they must rebuild that business after the war, when government has lost all interest in its existence, except as a source of tax revenue. That is why government can help greatly if now, during the war, it recognizes the legitimate concern of management to conserve those assets that will be essential to survival after the war.

Everyone recognizes the obligation of government to demand that the individual business go all out for war production, to forbid the production of goods not essential to wage war and to commandeer those that are, to require that a business sacrifice its markets and disrupt its distribution organization. No one questions the right of government to restrict arbitrarily the amount of earnings that a business may retain as profit from its war activities. In short, no one questions the right of government to become the dominant partner in any business that may be needed to win the war and, as dominant partner, to put the national need above any conflicting interest of the business.

But, as it does all this, government should remember that the survival of that business is staked on the public's knowledge and use of those discontinued or commandeered products, on the stability of that crippled dealer organization, on the ability of the business to maintain its standing in a market-place from which, temporarily, it may be barred.

And government can help management to deal with the exacting task it now faces, if it will do all it can to avert the needless sacrifice of business interests that do not conflict with war needs, if it will but remember that one of these days, that business again will be on its own, gathering up whatever resources it may have left, recreating its markets, rebuilding its distribution channels, reestablishing itself as a going concern . . . and doing all this in a competitive world without benefit of war orders.

The only foundation upon which any business can hope to rebuild when that day comes is its customers' memory of its name and their understanding of its products. Whatever credit may be coming to it for its war effort will not avail it very much if it permits itself to be forgotten. Its chief assets in that day will be the identity, recognition, and acceptance it still enjoys amongst those to whom it must look for business.

That is why so many business men, already going all out on their war jobs, become apprehensive whenever some word or act of a legislator or government official seems to question the validity of their sales, promotion, and advertising activities during the war. For they know that it is by such measures alone that any management can hope to conserve — while its business goes to war — the values it will need when it returns to civilian service.

That is why I ask government to do all it can to allay such uncertainties, to reassure business of its desire to help conserve those intangible assets that mean so much to business security. For that, I believe, will strengthen the hand of management in a big way as it goes all out on the vital job Donald Nelson has staked out for industry.

* * *

He has told us that if we are to make these ten silver months productive enough to make up for the golden months that are gone, industry must do things it never thought it could do. That is dead right. For America now finds itself in a position it never thought it could be in.

All too slowly, but very surely, it is dawning upon us that this is OUR WAR. Moreover it was our war long before we knew it or did much about it. So our job today is not merely to match the current production of our enemies. That is not enough. We must produce also enough to match the surplus of resources they had built up before we got started. We must produce enough not only for our own needs, but also for all the United Nations.

Moreover we must produce all that we need for *decisive* victory, for anything short of that will mean defeat. If we would save the American way of life, we must destroy once and for all the forces that threaten it. A stalemate would mean but an armed truce and what that might do to the American way of life and to American industry no one dares to guess. Victory must mean *decisive* victory. And this, very definitely is our war.

And just as definitely, this is OUR YEAR. For in this year — 1942 — we must prevent our enemies from achieving an advantage that might put victory forever beyond our reach — despite all our vast resources. It is an appalling fact that victory may slip beyond our grasp — not in 1943 or in 1944 — but during the months just ahead of us.

"Industry's responsibility in all of this is great," says Donald Nelson. "The job will take brains and initiative, but we can do it if we go out with a will."

To Mr. Nelson, that initiative means that industry must lead rather than follow in the march to more intensive use of our machines and our man-power. We dare not wait for new facilities to meet our mounting needs. More and more we must press for more widespread subcontracting and conversion. And he is counting on that initiative, backed by ever more aggressive effort, to avert or to minimize the compulsory measures that now seem imminent.

"We must stop thinking about what we're going to do to the enemy in 1943 and start thinking of what we're going to do to him in March of 1942.We must make today the things we would be making next year . . . if we had the time to spare."

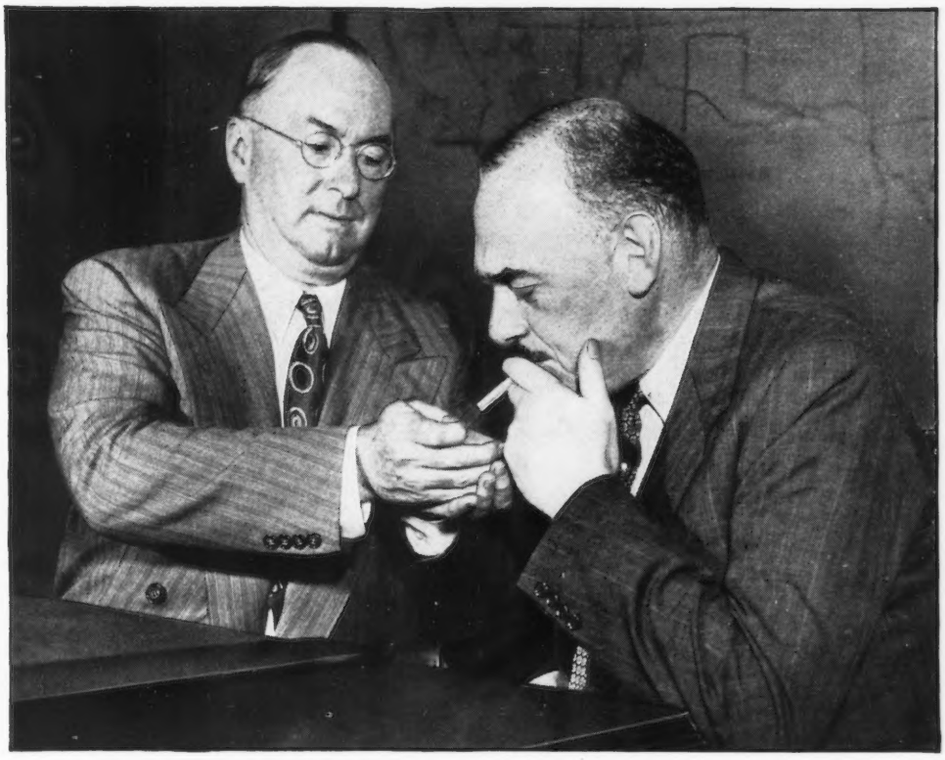
That, says Donald Nelson, is the task of American industry during the next "Ten Silver Months." And to that gigantic task American industry now must bend every ounce of its abundant strength.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

This message is appearing in all McGraw-Hill industrial and business publications, reaching over a million readers.

The Story That Must Be Told



Two men who know the story best: Donald Nelson, Chief of the U. S. War Production Board, and (right) Oliver Lyttelton, Great Britain's Minister of Production.

BETWEEN THE LINES of today's war news is written a story that is even more vital than the news itself. For through that story we begin to discern the pattern of victory, not yet complete in all its details but increasingly clear in its essentials.

It is the amazing story of how American industry has responded to the call for the weapons of total war, of how its technicians, workers, and managers are driving through an unprecedented task of fantastic size and complexity.

France fell in June 1940. During that month this country produced about $150,000,000 in war goods. By June 1941 the Nazis had overrun the Balkans; and in that month our war production was $800,000,000. The fateful month of December 1941 gave us an output of $1,800,000,000—an increase better than tenfold in eighteen months. And in May 1942 our total expenditures for war equipment and supplies mounted to the staggering total of $3,500,000,000.

This is an increase of twentyfold within two years, of itself a stupendous industrial achievement. But what is even more important, that achievement already is making itself felt the world over—in the Orient, in Australia, in Libya, in Europe, in the Coral Sea, at Midway Island, at the Aleutians, and wherever else we find a battlefront manned by free men.

To accomplish it, many industries have been pouring out war materials at a rate that only six months ago did not seem even remotely possible. Starting from scratch, our factories have turned from their peacetime jobs, first to meet and then to surpass the most hopeful estimates of what might be expected of them.

To do this they have drawn heavily upon all of their resources. Their skilled and unskilled

man-power has thrown into the task a war-born will to work; their research staffs have bent to it all of their scientific resources; their engineers have applied to it their utmost ingenuity; their executives have devoted to it the full measure of that managerial skill which has won for American industry the respect of the modern world.

For the first time in history we have pushed the accelerator of the world's greatest engine of mass production down to the floorboard. Always in times of peace, factory men have had to gear production to what the markets would take. But now the market they are called upon to serve is hungry for the last ounce of potential output. For war confronts industry with a demand limited only by its capacity to produce.

During these feverish months, while a desperate world has watched breathlessly to see how American industry would perform as the arsenal of democracy, we of McGraw-Hill have followed with mounting pride — at times almost with wonder — a new miracle of industrial achievement.

Some day the full story of this American industrial effort will fill a brilliant chapter in the epic history of our times. Meanwhile it would be premature to celebrate the completion of this task. For victory has not yet been won; that still lies at the far end of a road that we may find to be long and arduous.

But even now we can be certain of one essential of that victory. American industry is doing its job; it is delivering all that the people have asked of it — and more.

As I have watched with my associates the unfolding of this picture, I have wished that it were possible to broadcast it, in full color and wealth of detail, to the people of America, so that they could understand at least, in part, the job their industry is doing for them. It would help, it seemed to me, if the men of industry themselves, each so intent on his own task, knew what their fellow-workers in other fields have been doing.

However, the managers of industry have been far too busy **doing** to talk. They are going to be just as busy for some time to come. Naturally, many details are yet to be spread upon the record and, indeed, the full story cannot be told. But that part of the story that can be told is well worth the telling and the hearing, if only for its revelation of the spirit of an awakened America, throwing its all into the fight against the tyranny that has brought so many of the world's little people under its heel.

The 1941 war production of the United Nations, exclusive of the United States, equalled the total 1941 war output of Germany with all of its captive plants and enslaved labor. Since Germany's 1941 operations were at maximum capacity no further increase is possible. British output has been expanding to the point where its 1942 production is considerably ahead of Germany's.

In May 1942 American war production passed the British output 50 days ahead of schedule. In 1943 it will be 3 times that of the British.

This has been brought about under the leadership of Donald Nelson and the War Production Board, the Army, the Navy, the Maritime Commission, with the cooperation of management and labor. It has been furthered by the cooperation of Oliver Lyttelton, British Minister of Production, and other British production authorities.

But the story goes far beyond that. It gives us a glimpse of the America as it will emerge from this war, its industries again setting world standards of production, which will become the spearhead of our post-war economy.

This is a story that cannot be adequately told in generalities. It must be told in some detail. For instance, the great accomplishments of the machine tool industry, the great forward strides made by the aviation industry, the tremendous achievements of the chemical industry, the amazing conversion of many industries will warm the hearts of Americans.

These aspects of the subject deserve the fullest treatment and will be told month by month in these pages until the story has been completely unfolded. We will try to give a concise overall picture of the war job that industry has done and still is doing. You will find it a thoroughly American story of high American achievement in which every American can take pride and from which every American can take hope for the future of his country.

The story is far too significant to be withheld any longer.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

This message is appearing in all McGraw-Hill industrial and business publications, reaching over a million readers.

Machine Tool Builders . . .

the men behind our war production achievement

It took Germany six years to get ready for this war, and Japan even longer. But in less than twenty-four months American industry, starting from scratch, has caught up with and surpassed the war production of the Axis.

When France fell in June, 1940, we unfortunately had no gigantic munitions makers, like the Krupp or Skoda works, to turn to. We had been devoting our attention to making refrigerators and vacuum cleaners and motor cars and lawn mowers. Ordnance output for our Army was a mere million dollars a month. A sad commentary on our National state of mind and our lack of responsible political leadership.

Yet during June of this year, our industries, transformed from peacetime pursuits, produced close to a thousand times that amount. A thousand-fold increase in two years!

The same spectacular gains hold throughout our war program—for ships, planes, guns, tanks, a thousand items. We are well on our way toward the 60,000 planes, 20,000 anti-aircraft guns, 45,000 tanks and 8,000,000 tons of shipping that the President asked us to produce in 1942, and toward the much larger production projected for the year 1943.

We are well on our way thanks to a number of factors, one of the most vital being the extraordinary job done by the machine tool industry. For it has equipped America's metal-working shops with the tools they need to turn out the vast quantities of war weapons.

The machine tool industry's importance springs from the fact that almost every metal product, from mechanical pencils to giant guns, is made with machine tools. They transform pieces of steel into parts for automobiles, farm implements and radios—and for airplanes, guns and tanks.

The Garand rifle, highly praised by General MacArthur at Bataan, has 72 metal parts requiring 1040 separate cutting operations on machine tools. A 40-millimeter gun mount is made up of 1500 separate parts, built to the tolerance of a Swiss watch. Each part must be machined, not once, but several times.

No wonder that when the American defense program was undertaken two summers ago, the American machine tool industry was the first to be called into service. Ninety-five thousand machines were wanted as quickly as possible from 250 builders who in peacetime had produced some 25,000 machines a year.

But the demand did not stop there. The Army, the Navy and the Air Force kept asking for more as the war production program was expanded again and again. Nor was that all. The entire anti-Axis world besieged Washington with urgent requests—from London to Moscow, from Ottawa to Chungking.

To a man the machine tool builders responded. New factories and additions to old plants were built, with deliberate disregard of the prospect that all these sharply expanded facilities could not be used after the war.

To increase output from existing plants practically every company went to two long shifts or three short ones. The industry's work-week was greatly extended. From the beginning of our effort, it has been the longest of any industry.

Working forces were enlarged from 40,000 to 110,000, and this latter figure does not include tens of thousands of employees with sub-contracting firms. Though machine tool building requires a higher degree of individual skill than most products, "learner" courses have been set up to train men quickly. Over 15,000 men and women now are in training.

The machine tool builders were among the first to go in for sub-contracting. They have farmed out parts, subassemblies and complete

machines right and left. To meet their needs, for example, repair shops of carpet mills are making milling machines, a laundry machinery company is producing radial drills, and an automobile body builder is making planers and boring mills.

Machine tool manufacturers quickly shelved peacetime practices to concentrate manufacture on the sizes and types of machines critically needed for the war program. They adopted mass production methods wherever possible, although machine tools are essentially a tailor-made product. They sent their sales engineers, as did machine tool dealers also, to hundreds of munitions makers with invaluable advice as to tooling up most efficiently for their particular jobs.

The swift action taken by the machine tool builders shows what private enterprise can do to meet a national emergency. They were the first to institute a voluntary system of priorities.

All of this involved an almost explosive expansion of the industry. Machine tool builders produced an average of only 7,500 machines a year from 1931 to 1934. In an ordinary year, output totals 25,000 machines. But in 1940, it rose to 112,500, and in 1941 to 187,500.

The 95,000 machine tools wanted for the original defense program were built and delivered within eight months.

Today more than 1,000 machine tools are being shipped to war factories every twenty-four hours, and for seven days a week. Each month's output exceeds that of an entire normal peacetime year and is five times that of the depression year of 1932. And each succeeding month is shattering all previous records.

It is this amazing performance that led Under Secretary of War Robert P. Patterson to declare that "machine tools are the foundation on which our production structure is built. American machine tool men are doing a stupendous job. Machine tools are now being turned out at a rate of $1,380,000,000 a year. Machine tool designers have worked to improve tools so much that machine tool effectiveness today is one-third to one-half greater than it was in 1930. Our production today is 16 times what it was—in capacity to cut metal—at the peak of the World War."

The results of this performance by this key industry, so satisfying to the Nation, do not spring wholly from the numbers of machine tools produced. They stem also from their improved quality and greater productivity.

Today's warfare differs radically from that of 1917-1918. It calls for mechanized weapons so complicated in design and built to such a fine degree of accuracy that they are beyond comparison with the weapons of a generation ago.

Machine tools, completely redesigned during the depression years, are meeting these new and exacting requirements. In addition, thousands of machine tools of special design, without counterpart in peacetime work, have been built.

The record of the war industries most directly dependent on the machine tool industry speaks for itself. One tank manufacturer alone is producing more than thirty big tanks a day. A midwestern plant is completing 35 anti-aircraft guns a day, round the clock without interruption. A tank engine factory, tooled up to make 650 units a month, is actually building over 1500 a month. Demolition bombs, destined for Berlin and Tokyo, are being made by the tens of thousands every month. Machine guns are being produced at a rate of 50,000 a month.

These manufacturers, all machine tool users, are far in advance of the timetables set for them.

All this is good news for the American people and bad news for the Axis. It is proof that American industry, with each individual and specialized industry doing its part, is living up to the faith put in it by the American people.

But it is more than that, too. It is a guarantee of our confidence in the peacetime future of American industry and of the free enterprise system under which this miracle has been wrought.

Perhaps more than anything else, the foundation of that confidence must be faith in the farsightedness, the ingenuity, the engineering and designing skill, and the managerial know-how of the machine tool makers.

On them we depend for the most essential tools of the post-war production economy. Without them, our vision of better living standards and full employment through more efficient production and distribution can never be more than a vision.

What they have done as the toolmakers for war is proof of what they can do as the toolmakers of peace. How they have done it as free men is a demonstration of what free men will do.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

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The Aviation Industry is doing its job...

A Year's Production A Week — Every Week

A MERE hundred planes a month in 1938; 200 in 1939; 450 in 1940; 1,600 in 1941, and today, as this is written, plane production goes on at a rate of 5,000 a month. A previous year's production now in one single week — every week.

So begins the story of the greatest industrial expansion in history; an industrial miracle that far surpasses anything our enemies ever have done or can do. Not only did we out-produce the Axis but the acceleration in our production during the past 12 months exceeded the greatest increase in German output during their forced-draft war preparation of 1939, when their production rose from 1,100 to 1,600 planes per month.

The toughest part of our job was accomplished in 20 months. We boosted deliveries from 100 or so to 1,000 planes a week, passing the combined Axis powers. Today, Germany's curve is flattening; ours is climbing steeply. Lt. Gen. Henry H. Arnold, Chief of the Army Air Forces, assures us that Army contractors will produce not less than 148,000 planes in the remainder of 1942 and in 1943. During that same period Navy contractors will turn out at least 37,000 additional planes.

Manpower in the airframe, engine and propeller industries was increased from 125,000 to 450,000 workers during the past 20 months, with the prospect that the industry will be employing more than 1,000,000 men and women in 1943. Many manufacturers are solving their personnel problems by recruiting women workers. More than 40,000 of them — teachers, stenographers, waitresses, housewives and school girls — today are welders, assemblers, machine operators and inspectors on aircraft production lines. Productive floor space in the airframe, engine and propeller industries expanded from 18,000,000 sq. ft. to nearly 55,000,000 sq. ft. during the last 20 months. Further expansion to more than 60,000,000 sq. ft. may be expected this year and an ultimate figure of more than 100,000,000 is a distinct possibility.

To grasp the full magnitude of this task we must remember that a single medium bomber has 30,000 parts, which are built into 650 minor sub-assemblies to make 32 major sub-assemblies. The entire process involves 30,000 man hours of labor. Each of the two engines in this plane requires 50,000 specialized inspections. Every one of the 50 instruments entails many hours of precision workmanship. Yet today there is one factory turning out 4 bombers every day. Another produces fighters at the rate of nearly 20 a day.

To the amazement of the entire world these manufacturing miracles were accomplished without sacrificing the high standard of American aeronautical equipment. There has been some loose talk about the quality of our combat airplanes as compared with those of our allies and our enemies. Indisputable evidence of the superior stamina of our aircraft under fire is written between the lines of almost every war communique. Every battle record tells a story of heavy losses inflicted at small cost upon numerically superior enemy forces. The consistency of this performance on all the far-flung battlefronts constitutes the most eloquent testimony of the high calibre of our designs, our manufacturing methods and the skill and daring of our pilots.

And let us remember that our decisive victory in the battle of production was not won without headaches and heartaches on the part of management, labor and government.

When the President sounded the call for 50,000 planes in the spring of 1940, the program called for only 5,500 military aircraft. Government and industry reeled from the shock — both determined, however, that it *could and would be done.*

The Army, the Navy and the old Defense Advisory Commission set to work to draft a program. This has been revised many times — upward! Congress then proceeded, more slowly, to modify the laws that would have obstructed the realization of the objective. Then the aviation industry, without contracts, in the face of discriminatory profit-limitative legislation, and with nothing but oral assurances of governmental intentions, went ahead with its Herculean expansion plans. New factories were completed long before facilities-contracts and their funds were forthcoming.

The rugged individualists who had founded and built the aviation industry cast aside their rivalries and embarked upon a period of unselfish cooperation. Priceless engineering experience was exchanged. Material was relinquished for transfer to plants where it was needed more urgently. Successful personnel training methods and experience in the use of women workers were pooled for the benefit of all concerned. During one re-

cent month, the cooperation among eight southern California plants averted more than 1,860 potential bottlenecks in production.

As the lessons of the war dictated the need for greater numbers of particular airplane types, many manufacturers accepted orders for planes designed and developed at rival factories. Striking examples are the long range bombers being turned out by plants where only trainers, fighters or dive bombers formerly were made.

Mindful of the risk involved in educating rivals, thereby creating future potential competition, subcontractors nevertheless were sought and trained by pioneer manufacturers. Makers of toys and wheelbarrows, automatic stokers and linoleum were among those who rallied to the call. Within a year subcontracting rose from 13 to 36 per cent of the total program. It still is rising.

When the automotive industry came into the picture, aviation manufacturers gave generously of their time and knowledge to start the newcomers. Liberal licensing arrangements enabled them to reap the full benefits of technical developments. Automotive engineers swarmed through the aviation plants in search of the exacting "know-how" of the aeronautical industry.

Each type of aircraft that reaches the production stage is the result of long periods of research, design and development. The unseen workers toiling in the wind tunnels and the laboratories of government and industry are the unsung heroes who tirelessly are striving to surpass all previous efforts. Their brilliant accomplishments are eloquent testimony of the superiority of men and women who are blessed with freedom of action and thought. Today more than 20 experimental combat airplanes are under development and will replace older types as soon as they fulfill the exacting requirements of our armed forces. Among these are aircraft that promise to outfight and to out-perform any and all of the much vaunted warplanes of the Axis military machine. And this without loss of production.

Every man, woman and child of all the United Nations may fervently be thankful that those who chart our course in aircraft production have not frozen design to such a degree as to make impossible the immediate adoption of improvements as they come out of these laboratories.

What does this brilliant record mean in terms of final victory?

Every newspaper reader has learned this basic war lesson . . . air supremacy is the essential ingredient of military success. As the balance of air power shifts, so do the fortunes of war.

In those dark days when our output was 500 planes a month, Germany's was 2,000 and the German air force was twice that of our Allies. When we reached 2,000 a month last fall, Germany had advanced to a monthly rate of 2,500. Today, as this is written, we have caught up with the enemy's backlog. The air forces of both sides are about equal numerically and United Nations' production exceeds that of the Axis by 27 per cent. Next summer (1943) both the air force and the output of the United Nations will be double those of all the Axis powers.

That is the pattern of ultimate victory!

The pattern of the peace to follow also is gaining in definition. The airplane has shriveled the world to one-fifth its former size. Its use as an instrument of destruction is but a momentary distortion of the pattern of human progress. Its potential power, as a stern preserver of peace, is beyond imagination. Today's air routes of our Army Air Force Ferrying Command are the international trade routes of tomorrow. Giant airliners, by reducing time and space, will speed fraternity among the nations and disunity will give way to better understanding and goodwill.

Flying freight trains, with aerial locomotives towing glider boxcars, will serve large cities, decentralizing population and giving to inland cities many of the commercial advantages of seaports. Air mail and passenger pick-up lines will fill the gaps between these transcontinental trunk lines and tie in the smallest hamlets. Universal fly-it-yourself services will provide airplane facilities for those who do not own low cost private aircraft. Roadable rotary wing aircraft and family planes of the fixed wing type may even run household errands.

The coming generation of business men who today is piloting our war planes will find aircraft as essential to business as it now finds them essential to victory.

Commenting on our war production record, Donald Nelson has said, "We are today in the position of men who realize that they are actually doing the impossible".

The mass production miracle that the aviation industry – management and workers alike – has performed through the all-out effort of free enterprise can and will serve civilization in peace as it has in war.

With this boundless new medium of transportation and its concurrent technological developments we shall rebuild our way of life to a rich, new fullness upon the ruins of a war-torn world.

President, McGraw-Hill Publishing Company, Inc.

This is the third of a series of editorials appearing monthly in all McGraw-Hill publications reaching more than one and one-half million readers.

The Chemical Engineer cuts years to months...

Born in the turmoil of the last war, he is shaping a new world with mighty swords and magic plowshares

GERMAN CONSUL-GENERAL HOSSENFELDER, writing from New York on March 3rd, 1916, to von Bethmann-Hollweg, chancellor of the Imperial German Government, confidently predicted defeat for the United States because we were totally dependent upon the great chemical industry of Germany. "Americans," he wrote, "can never establish such an industry. They have the resources but they lack the necessary science and technology. And, besides, the conflicting selfishness of American business renders it impossible."

Even before the ink was dry on Hossenfelder's letter a new figure appeared on the industrial scene—the American chemical engineer. With the help of patient, but progressive and venturesome capital, he laid the foundations for the largest and most resourceful chemical industry in the world.

Today he is an all-important figure. For we are fighting a chemical war, even though the emphasis that is placed on planes, tanks, ships, guns and other armament tends to obscure that fact. And this chemical engineer is waging war for us on a prodigious scale. Bombers carry more tons of more deadly explosives because he has developed stronger and lighter alloys and more efficient fuels. Tanks are better armored and wield heavier blows because of products and processes born in chemical laboratories. Ships are welded together by new metallurgical techniques that save precious months over older processes. Gun barrels that are made in minutes instead of hours shoot farther and faster because of better ammunition.

And quantity keeps pace with quality. By mid-year of 1942, explosives were being produced in newly constructed plants twelve times faster than a year ago. Smokeless powder output has been doubled since December. Five times as much TNT was being made in July as in the months preceding Pearl Harbor. One single new plant produces more of this high explosive than did the entire pre-war industry—and several of these plants already are in production.

By what Major General William N. Porter, Chief of the Chemical Warfare Service, calls a "miracle of production," the sort of incendiary bombs that General Doolittle's lads showered on Tokyo were rolling out of our plants within a few weeks after we got into the war. As General Porter puts it, "they were rolling not by hundreds or even thousands, but by the millions." That record he has cited as a tribute to the "ingenuity, industriousness and patriotism" of the American chemical industries.

Yet the General agrees that we have only started to produce in the tremendous volumes that will shortly make Germany, Italy and Japan "revolve on their boasted Axis." Our newest plants are just coming into production. They face no limiting shortages of materials for, in the main, our chemical industry draws its strength from coal, salt, sulphur, limestone, oil, natural gas, coal-tar, air and water—all available in abundance.

We have heard little about the use of poison gas by our enemies. It may be that good reasons for this are stored away in our well-stocked chemical arsenals. American chemical manufacturers have worked hard and long with our armed forces so that if the time ever comes to make good on the President's warning of retaliation, America will be more than ready.

And defense against gas has not been overlooked. Every soldier is equipped with a most efficient type of gas mask, developed through twenty-five years of intensive research. The Chemical Warfare Service already is manufacturing millions of masks for distribution to civilians. Let us hope we may never have to use them. But if we must, we need have little fear of any gas or secret chemical.

This gas mask program has been made possible by a literal metamorphosis of production facilities, as peacetime industries have been converted to war purposes. A lumber company, for example, is making activated carbon from sawdust. Novelty manufacturers of rubber goods are turning out valves and assembling other parts. Former manufacturers of shirts, swim-suits, shoes and beds have converted their facilities and are contributing their share. More than eleven hundred contractors and two hundred and fifty sub-contractors are supplying their full quotas of chemical warfare materials. And production is right up to schedule.

But the bulk of the war job of our chemical industries has to do with items other than weapons and

ammunition. The German Consul-General, in that 1916 report to Berlin, said that many American industries were in a critical condition because of the scarcity of German chemicals. He related in particular that "the cries for help from the world of physicians are becoming louder and louder and more and more insistent." Thanks to our chemical industries this cry no longer is heard. Even though we are again cut off from quinine, camphor and some other strategic medicinals, our homes and hospitals are adequately supplied with synthetic products. Most of these are better and cheaper than the natural materials. The same sulfa drugs that have saved so many civilian lives in recent years have gone to war, with the result that deaths from infection at Pearl Harbor and Bataan are reported as surprisingly low. In this war we suffer no shortages of iodine and potash. Pioneering research in the field of vitamins has led to new industries that are contributing to health and better nutrition.

Those new uniforms the soldiers are wearing are of better quality and will last longer than the shoddy, ill-fitting outfits of 1918—thanks to sunfast dyes and new man-made products. And in the field of fabrics, nylon and the new rayons have gone to war in parachutes and super-strong cords for tank treads and tires.

* * * * *

And that brings up the question that 30,000,000 American motorists are asking with ever increasing concern. "When, Mr. Chemical Engineer, are you going to give us a set of new tires for the old family bus?"

That, I am told, is just what the chemical engineers have set about to do on a scale that is difficult to comprehend. In the words of Raymond Clapper, the columnist, "the synthetic rubber program for this year and the next is the biggest job of chemical engineering ever undertaken in the world." A billion dollar industry is being built at record speed to make almost a million tons a year of chemical rubber to serve our war needs and those of our allies. This cannot be accomplished overnight. Many months are required to design and fabricate complex equipment, much of which must be made from corrosion-resisting metals and alloys. We shall be lucky if a tenth of the desired capacity is in continuous production this year and even more lucky if, by the end of next year, the new industry should be turning out synthetic rubber at a rate of 875,000 tons—using both petroleum and grain as raw materials.

All this, of course, must go for essential military uses but there is reason to believe that in the laboratory and pilot-plant stages we have some promising substitutes and stop-gap materials that may tide us over until the big program starts rolling.

The present prospect of real success is possible only because of the cooperation of the chemical, rubber and petroleum industries. Individual firms and entire industries have set aside their normal desires and selfish interests to pool their patents, share their research and engineering developments for the common good. Synthetic rubber is here to stay as the basis for a great post-war industry: no doubt as to that lingers in the minds of the men who have seen many other natural products—indigo, alizarine, camphor, vanillin—all eventually fall before the ingenuity of the chemical industry.

* * * * *

In the coming peace to which we look forward hopefully, we shall find a new world full of new materials, new conveniences, new jobs, new opportunities, all stemming out of the present-day work of the chemical engineer. The same tough, transparent plastics that now make noses for bombers will give us new frameless windows for our homes and automobiles. With capacity to produce at least 2½ billion pounds of aluminum, which is five or six times pre-war production, and a magnesium capacity 50 or 60 times the pre-war figure, many new uses will develop for these structural materials of great strength and amazing lightness. Almost anything that flies, runs, moves, or otherwise is motive, will have a place for them. New fibers such as nylon and vinyon had scarcely got started before they were put to war use. Once the war is over they will be with us in greater abundance and at lower cost for a variety of uses so vast and so diverse that we can scarcely imagine them.

And the chemical engineer continues to create and to invent. He meets the challenge of scarcities and shortages with ever new "substitutes" that excel their originals. Even before the war is over he will have placed at our command a hundred new materials which we did not have before. His workshop is all industry. His contributions are as limitless as are our needs.

But right now his all-important job is to help win the war; to fight to a finish the ruthless and resourceful enemies that are devoting all their science and technology to bring about our defeat. So, as we take stock of our assets in this desperate struggle, we count among the first the proved resourcefulness of the research-minded chemical engineers we now have mobilized to help us fight this chemical war.

James H. McGraw Jr.

President, McGraw-Hill Publishing Company, Inc.

This is the fourth of a series of editorials appearing monthly in all McGraw-Hill publications reaching more than one and one-half million readers.

Construction—Builder of Bases

America's Great Peacetime Industry Goes to War

PUNCHED through 1,600 miles of trackless wilderness and rivaling the Panama Canal in strategic importance, the Alaska Highway will cut days and dangers from present supply routes . . . to Alaska . . . to the Aleutians . . . yes, to Japan itself!

This job, to be finished soon and well ahead of schedule, is but one example in thousands illustrating how construction sets the stage for our war effort . . . and why the construction engineer is vital to victory.

Back of America's busy production lines, expanding shipyards, growing cantonments and far-flung military bases is a series of swiftly executed construction jobs. Important jobs! *For the construction industry is a builder of bases. Bases for production—for training—for defense—and for attack.*

To conceive and to carry through so tremendous a program in a race against time is typically American. It requires enterprise and the sort of versatility that has been acquired by undertaking every kind of job; from a Boulder dam to a drydock, from a Pennsylvania Turnpike to a housing project, from a Radio City to a railroad tunnel . . . and taking it in stride. War's demands in the eyes of America's construction men, are simply more of the same—for a grimmer purpose, and under heavier pressure.

The civil engineers who develop the necessary designs, the contractors who execute them and the manufacturers who provide the equipment and materials, are as much a part of this war as are the men who face the enemy. The results of their labors are recorded in mounting production figures, and will be indelibly written in the military annals of this war. Those 60,000 airplanes, 45,000 tanks and 8,000,000 tons of shipping that the President asked for in 1942 will be supplied because—and only because—the construction industry did a Herculean plant-building job first—and fast.

This is the fifth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

Yes, construction, America's great peacetime industry, has gone all out for war. From a normal 6½ billion dollars in 1938, it got into its war stride last year with a 11½ billion dollar volume. And under the impetus of Pearl Harbor, the 1942 figure now promises to reach the unprecedented total of 15 billion dollars. "If buildings would win the war, Hitler would be licked now", said Lieut. Gen. William S. Knudsen recently. Which emphasizes the further fact that the construction industry was the *first* to go to war.

The technical and managerial talent that is accomplishing this mammoth job has had to find its strength and resources within itself. No possibility of "conversion" here! Only years of varied construction experience enabled it to tackle and to achieve the manifold tasks that building for war demands.

Take that cornfield, for instance, that Henry Ford picked for his record-breaking bomber plant. The spring mud was soft and deep when contractors moved in last year. They were entering a race against an almost impossible time limit. Before they could even begin on the plant itself, they had to build roads, lay a 4-mile water supply line and install a complete sewerage system with its disposal plant. But such varied jobs—each big in its own right—merely were antecedent to running up the framework and enclosure for the 60-acre factory itself. Or to using road-building methods to pave a floor that was the equivalent of 25 miles of 20-foot wide concrete highway.

It was a race against the approaching winter, and to win it they had to push their $1,000,000 worth of construction equipment to the limit—day and night. But win they did! It is accomplishments like these that explain how the nation's aviation factory floor space jumped from 18,000,000 to 60,000,000 square feet in

the past two years . . . why Fortresses and fighter ships are beginning to turn the scales of war in our favor.

"Somewhere in the Southwest" the Army called for a training base. The contractor who answered that call summed up his performance in characteristic fashion: "Beginning without so much as a contour map we had a $10,000,000 project ready for operation within 90 calendar days, and saved 3½ million dollars of the estimated cost".

At another Army camp a contractor assembled a crew of 20,000 men who put together 1,400 buildings in 125 working days, along with a sewer system, a water-supply and a street layout of which many a fair-sized city might be proud. This job swallowed up 2,000 carloads of lumber, and 26,000 kegs of nails. So perfect was the teamwork, from the general manager down through the hundreds of superintendents and foremen to the specialized crews, that as many as seventy buildings were erected in one single day.

But versatility and experience are not the only qualities that the construction engineer has in his tool chest. He has ingenuity, and he needed it when steel, copper, zinc and aluminum had to be used for combat equipment, and were denied him. Great hangars, conventionally of structural steel, were turned out with record-breaking timber arch spans. Reinforced concrete factories were designed to require only 3 lb. of steel bars per square foot instead of the customary 5 lb. Asphalt-impregnated paper was substituted for copper in flashings, cement-asbestos for galvanized steel in duct work. In the face of a materials shortage, he continued to build bases—safely, economically, and on time.

Construction ingenuity, too, is back of the records in Liberty ships, in war housing and a host of other facilities. Indeed, it was the construction industry that stepped forward to assume the bulk of the emergency shipbuilding program, leaving established yards free to handle more specialized Navy work. Naturally, it was easy for civil engineers and contractors to build the shipyards, but building ships was another story. It is a far cry from steel ships to conventional engineering structures, yet, drawing upon their bridge and building experience, the men of construction have turned out ships faster than they were ever built before.

How was this possible? . . . because the construction man sees every job as a new problem, views every precedent as something to be discarded in favor of something better. So instead of assembling the myriad separate pieces of each ship on the ways, he fabricated them into huge built-up sections. These he swung to the ways and welded them into place in a fraction of the time required by old methods.

Again, the demands for wartime housing for workers in industrial areas, at Navy bases, and near Army concentrations, have altered the meaning of "residential construction". The building of individual houses has given way to a form of multiple-unit project that calls for the skilled services of the architect, the civil engineer and the large contracting organization. On one such project, for example, a contractor experienced in large building and bridge construction employed an extensive system of prefabrication and site assembly that made possible the completion of 5,000 houses for war workers within five months.

All these activities, within the United States, parallel the achievements of other industries that serve the men at the front. But construction knows no continental limits. Its men are serving throughout the network of defense bases built in the West Indies, Greenland, and Iceland, and in the offensive bases that are taking form in the jungles and deserts of Africa, the harbors of the Persian Gulf, and the plains and mountains of Australia and Alaska. Already in this war, as in the last one, construction crews, like those at Wake and Guam, have dropped their peacetime tools to fight shoulder to shoulder with their comrades in uniform. Construction follows the flag to the farthest outposts in this global struggle.

* * * *

But while the construction industry thus serves the special needs of the armed forces, it must look after its job at home. It must keep the highways serviceable, the water supply safe, sanitary facilities adequate. There are home chores that cannot be neglected even in war.

And when we finish our No. 1 task of winning the war, the construction industry will again be called upon to help re-establish peacetime employment and to stimulate the normal industrial activities of the nation. It will raze, redesign and rebuild; it will bring modern sanitation to urban dwellers; it will safeguard fertile areas and cities from disastrous floods; it will improve all forms of transportation; it will design and build the facilities that will be needed to reconvert from war to peace. Its vision, versatility, experience and ingenuity will be as indispensable then as they are vital now.

Today it is building the bases that are needed back of every battle-line. Tomorrow it will build for a new and better era. Today it is laying the foundation for the victories that must be ours. Tomorrow it will lay the foundation for the peace that will follow these victories. In war and in peace the construction industry is the builder, the harnesser of nature's forces.

President, McGraw-Hill Publishing Company, Inc.

Electronics—Secret Weapon of War

Presager of a New Scientific and Industrial Era

THE END of World War I left scientists with a new plaything. They did not know it at the time but they had their hands on a revolution. Within two years the world had radio broadcasting. Within ten years the whole art of motion pictures had been transformed as talking pictures replaced silent movies. Within twenty years television was born and people were seeing pictures in motion by radio.

The fulcrum of this revolution is the electron tube, a new tool of illimitable possibilities. One form of the electron tube is the familiar radio tube; the much publicized electric eye is another. There are many other forms, each having distinct capacities for saving time, saving energy, saving money, protecting life, limb and property.

The electron tube puts the electron to work—and the electron is the basic building-block of the universe.

Electronics is the new art, the new science of putting the electron to work. Radio and sound pictures and television are aspects of electronics; but there are many other facets of this revolution which have been brewing since the last war.

The electron tube has a typical American family tree. Edison made the basic discovery of the "Edison effect" some sixty years ago. This was followed by the invention of the "Fleming valve" and the "de Forest grid". Then Armstrong contributed his share, and hundreds of engineers in garret and cellar workshops and in the great university and industrial laboratories went to work on the tubes which employ electrons. The tube was a plaything before the last war but the world conflict brought it out of the toy stage and made it a practical, powerful tool.

Today the electron tube is guiding the destinies of the greatest armies and fleets ever engaged in the history of the world.

It is a part of the nerve center of the battleship, directing its course, finding its adversaries, broadcasting running accounts of air battles to its crews, directing gun fire and determining ocean depth.

In the air it is the means of locating and identifying enemy planes, piloting planes automatically, giving communication from plane to plane and to shore. It is even operating the controls of the plane.

In the maneuvering tank, in the officer's car, on the back of a foot soldier it transmits and receives vocal messages from every unit of the fighting forces.

Along our borders, and those of our Allies is an electronic screen which counts, follows and identifies enemy planes a hundred miles away through darkness and through fog.

In industrial plants there are electronic counters that enumerate passing articles faster than the eye can see; automatic sorters which discard defective, oversize, undersize, off-color articles; automatic cutters; devices which inspect the inside of things which the eye cannot see; controls which protect workers; controls of temperature; smoke eliminators; intruder alarms; automatic controls for whole batteries of machines.

In its October progress report on American industry, the War Production Board points out that the radio business is *five* times greater than a year ago. From 20 million dollars a month last fall, it has increased to well over 100 million dollars a month. Unfilled war orders are in excess of 4 billion dollars.

From such vast growth will emerge a new engineering of products which will immeasurably improve our peace-time living.

After the war broadcasting will be infinitely more satisfactory: radio receivers will perform with a new fidelity which will amaze us. Television reception will be as flawless as the motion picture. Present secret war developments will readily be convertible to peace-time devices that will improve our standard of living.

No longer will ships collide with other ships, with icebergs or the shore. No longer will trains collide and aircraft crash in flight.

Garage doors will open as we approach and automatically close themselves. Electric lights will automatically go on and off according to our wants and needs. Furnaces and boilers will be controlled and smokestacks will cease to belch wasteful smoke. Air will be made dust free and germ free. Food contamination will be checked, meat made tender.

Grade crossings will be made safe and auto traffic will be automatically controlled.

Medical science sees new wonders ahead. Already it is possible to see "whiskers" on germs, germs which heretofore had been but a blur when viewed through the strongest optical equipment available.

Today so much secret development is going on in the ultra-high-frequency field that little can be said of its great future. But, without divulging military secrets, it can be said that ply-wood is being dried electronically in minutes instead of hours. Ultra-high-frequency welding (not to be confused with flame welding controlled electronically) is being done dramatically and efficiently.

Ultra-high-frequency heating promises to revolutionize the baking industry—it may even heat our homes.

What is this miracle working tube that can see, hear, taste, feel and smell a thousand times more sensitively than was possible heretofore?

What is the electron? No one knows, not even the scientists who know how to employ it. Electrons cannot be seen or felt; but if 6¼ million million million electrons are pushed through a 100-watt electric lamp per second, it will light up to full brilliance. For electric current merely is a mass movement of electrons. Each electron carries its share of electricity, and since the electron has so little weight it can be moved easily and quickly. Therefore, electricity transported by electrons can be turned on or off with great ease and speed. The electron tube merely is a device that controls the flow of electricity. It is an amplifier of power which can be made to do wondrous things. The sound of a termite gnawing inside of a log can be amplified a million times . . . to a roar that can be heard over great distances.

Colors can be classified and matched to a degree not possible by any other means.

Chemical or vitamin consistency can be recognized by counting radio activity within the subject being analyzed.

There is no industry in which electronic circuits cannot be used to speed up production, to increase accuracy, to do heretofore impossible tasks of calibration and measuring.

The opportunities afforded the engineers who are developing this new "electronic age" are limitless.

* * * *

Today the electronic industry is 100% at war. It is meeting the exacting demands made upon it.

Never before was electronic equipment called upon to withstand temperatures ranging from 75 degrees below to 150 degrees above zero Fahrenheit. Never before did radios and transmitters have to withstand the shaking and abuse to which they are being subjected today.

War demands have called for much redesign, much change of materials and a new conception of operating to tolerances never dreamed of in peace-time material. As a result, electronic parts and equipment makers are building better devices.

Universities and colleges are working at top speed to produce electronic engineers, for every radio operator in a plane, every radio man in the ground forces and on ships, every man operating radar equipment or electronic control devices in ordnance . . . and there are many thousands of them . . . must be a trained technician.

The wall of military censorship is high but it is no secret that one of Britain's best weapons that keeps the Luftwaffe from exterminating London is a radio locator, a device that gives alarm of approaching planes long before they can be seen with telescopes. Scanning the horizon constantly the locator warns of the enemy's approach. In the nose of a night fighter, the locator informs pilot and gunner when the enemy is within range. Neither is it a military secret that gunfire can be controlled by electronics, and that electronics is having a big share in training our new armies.

Necessity draws a veil over the most dramatic uses of electronics in warfare, but among those who know there is nothing secret about the fact that many of today's wartime applications will revolutionize our peace-time lives. Electronics will invade every industry with totally new devices and machines. The future of the electronics industry is limited only by man's imagination.

Such is electronics, and its destiny!

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

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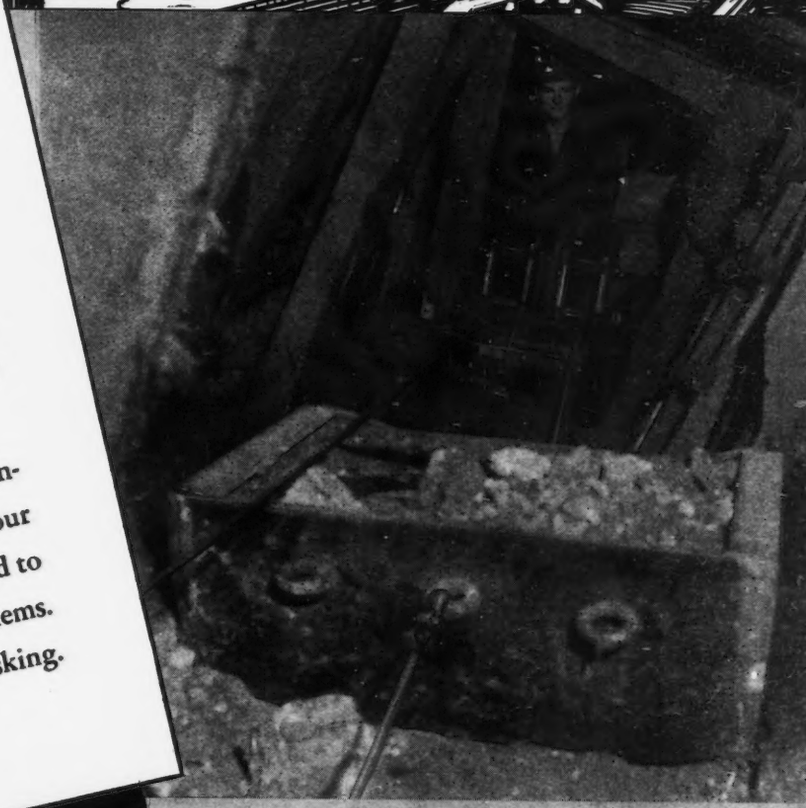

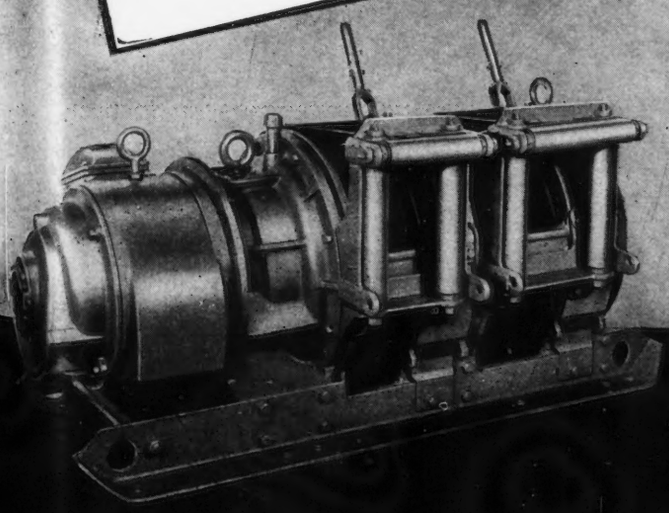

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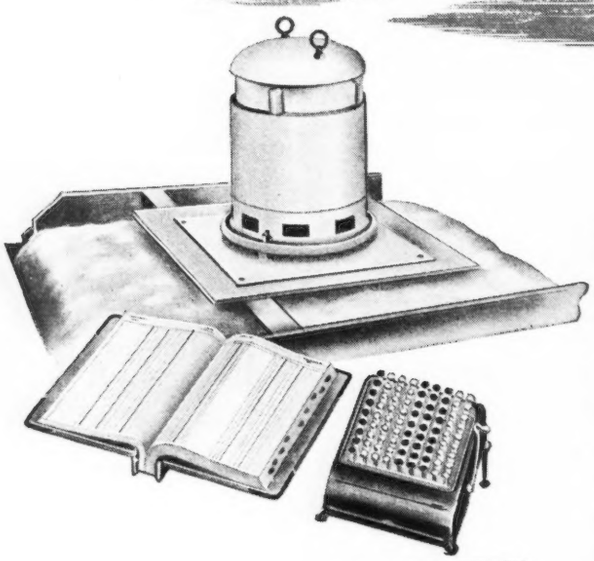

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ENGINEERING AND MINING JOURNAL, December, 1942, Vol. 143, No. 12. Published monthly, 99-129 N. Broadway, Albany, N. Y. Subscription rates: United States and possessions and Canada $3 a year, $4 for 2 years, $5 for 3 years. Other countries in the Americas outside the United States and Canada, $4 a year, $6 for 2 years, $8 for 3 years. Great Britain and British possessions, 30s. a year, 60s. for three years. Elsewhere $5 a year, $10 for 3 years. Price per copy, 50c or 3s. Price of this issue $1.00 or 6s. Entered as second class matter September 18, 1936, at Post Office, Albany, N. Y., under the Act of March 3, 1879. Printed in the United States.

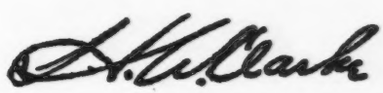
Mining "Bullets" with every Ton! . . .

WITH adequate priorities for essential mines again indicated in current WPB planning, we welcome signs that government agencies, labor leaders and mine managements are getting coordinated nationally through Labor-Management Committees to arouse the mine worker to the vital importance of doing the best job for the war effort *right where he is every work day*.

Victory production at every war plant *starts* at the mines. That makes the mine worker literally "America's FIRST Soldier on the Home Front." But *he* has to know it too! Unlike most of Uncle Sam's war industry workers many of our 1,000,000 mine workers must live and work and play quite isolated from the inspiring war spirit, understanding and elbow rubbing which help maintain production team work in our large industrial centers. Their hours of labor are necessarily spent in scattered, underground workings — where they are often alone, or working under conditions which restrict much of the close interchange between management and fellow workers that is so much a part of today's typical war manufacturing plant.

The American way of life has taught us that education is better than compulsion in working together as free men. It follows that happier mine workers, less migration to other war industries, unnecessary absenteeism and maximum daily output from *each worker and the machines entrusted to his care* will inevitably follow his glowing realization that he is literally America's *first answer* to victory production — and to the better life we all want for our children when this war-torn world is rebuilt.

So mine by mine let's "sell" this concept of his hard day's work—to every mine worker, to his family, to the other war industries that have been raiding mine labor and thus imperiling their own war production jobs at the source of their own raw materials, and to the public-at-large which is still so far out of contact with our isolated mining regions and thus all too ignorant of the Miracle of Production being performed in this war by the *Fighting Men behind modern mining*.



PUBLISHER

P.S. WPB has now released vacuum cleaners from "frozen stocks." Refrigerators and other household appliances (still frozen) would also help equip the miner's family for better war work and improved living standards otherwise inaccessible in most isolated mining camps. As "defense workers" aren't such essential mining homes eligible?

★ ★ ★ ★ ★ ★ ★ ★ ★

Strategic Metals PRODUCE Tools for victory

THIS NATION has dedicated its manpower; its spiritual and material resources to winning the war. You of the mining industry are straining every sinew to increase the production of strategic metals with which to fashion the tools for victory. Our Longyear organization co-operates in this objective by providing you with the means of speeding up your exploratory and development work. Three essential services are at your call. Here they are:

1 **Our Manufacturing** division will supply you with sturdily built Longyear diamond drills for exploratory core drilling either from surface or for underground use. You will find them indispensable in locating and proving up new ore reserves. Also, in keeping development work well ahead of mining so that steady production will meet required quotas. Certain models are adapted for drilling long blast holes underground which reduce the cost per ton of rock broken. Longyear diamond drills are made in a wide range of capacities. They are powered by air or electric motor, gas or Diesel engine.

2 **Our Contract Drilling** division will take over your core drilling job, furnishing the necessary drills, equipment, supplies, and men. Many clients prefer to contract their drilling for strategic minerals preferring to leave to us the responsibility of supplying suitable machines and experienced crews. Every contract is given careful engineering supervision with particular attention to maximum recovery of core and accurate sludge samples.

3 **Our Contract Shaft Sinking** division is available for sinking mine shafts; deepening old shafts, cutting stations and ore pockets. Your own operating conditions will determine whether you want us to assume full responsibility for the job under our competent engineering supervision. It would release you, of course, from the necessity of organizing outside shaft crews, saving your own crews exclusively for mining production.

If you are a producer of strategic metals, consult us on these three essential services. We are ready to co-operate with you in every way possible. Should delays occur, please bear with us for you will understand that emergency conditions are responsible.

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TRAYLOR—

Type G JAW CRUSHER.

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Long-lived Efficient Economical

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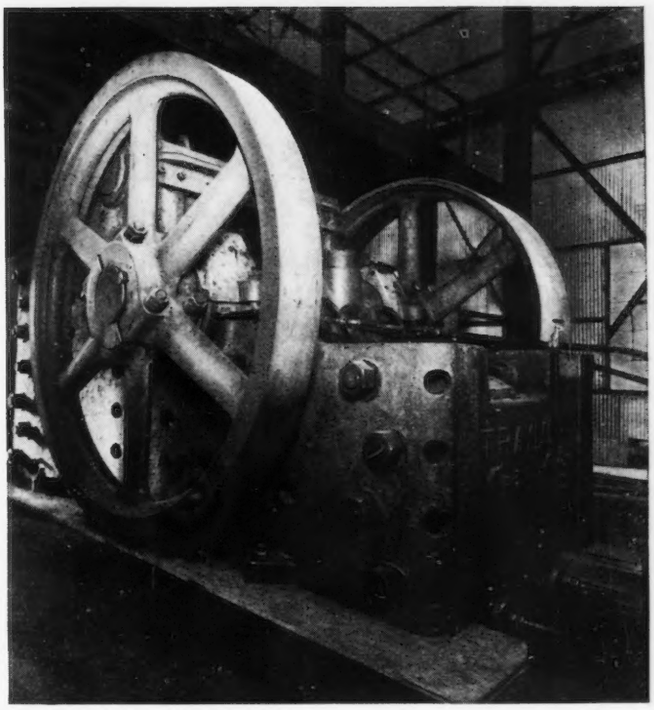

Whenever mining men need a crusher that is thoroughly reliable and a big producer *(which is all of the time)* they almost invariably think first of a Traylor Type 'G' Jaw Crusher. By experience, they know that this machine has built into it the four essentials to satisfaction and profit—*strength, foolproofness, economy and convenience.*

Maximum **STRENGTH** lies in the liberal design and the steel of which crusher's parts are made—cast steel Frame, Swing Jaw, Pitman Cap and Toggles, steel Shafts and Pitman Rods and manganese steel Jaw Plates and Cheek Plates. **FOOLPROOFNESS** is provided by our patented and time-tested Safety Device which prevents breakage due to packing or tramp iron. **ECONOMY** is assured by our well known Bulldog Pitman and Toggle System, that saves power and wear by minimizing friction, power that is used to deliver greater production. **CONVENIENCE** in transportation and erection in crowded or not easily-accessible locations, is planned for in advance by sectionalization to meet any restrictive conditions.

Many of the world's "greatest" mining companies have standardized upon the Traylor Type 'G' Jaw Crusher. Most of them have reordered, some of them several times. What this crusher is doing for them in the way of earning extra dollars through increased production and lowered costs, it will do for you! Investigate it closely. *The more closely you do, the better you'll like it!*

★
★
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WE BUILD

JAW CRUSHERS
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REDUCTION CRUSHERS
CRUSHING ROLLS
GRINDING MILLS
BALL MILLS
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Pick Your

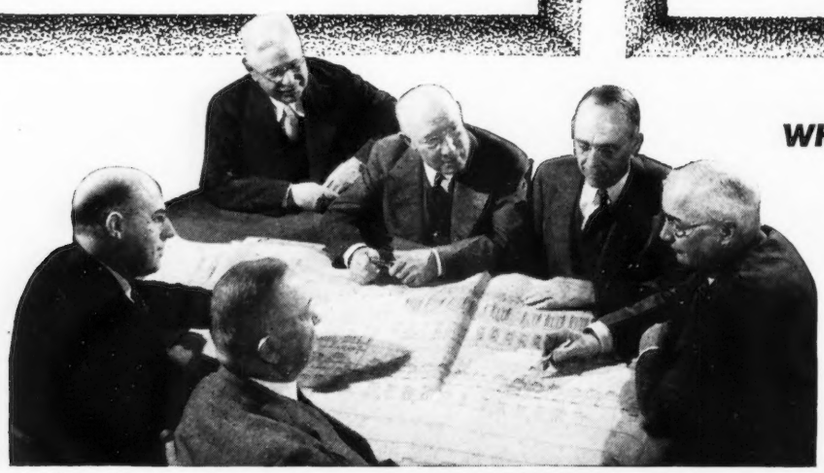
HERE ARE FOUR OF THE MOST PRESSING

Labor Shortage?

Does part of your process use men needlessly? Remember, mining is a machine industry!

Unexpected Breakdowns?

How many of your key machines were designed for 24-hour-day service? Good point to check today!



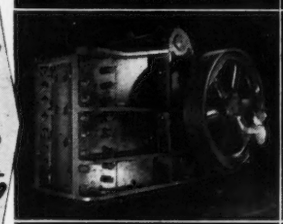
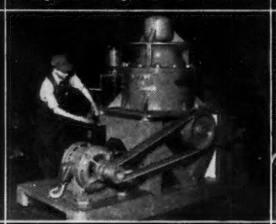
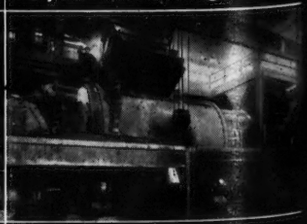
Collaboration of specialists is basic in A-C Cooperative Engineering.

WHICHEVER IT IS — CALL

MEN must work together better than ever before to win this war... *and so must machines!*

If failure of machines to work together properly is at the root of your wartime processing problem, remember there's one company that *specializes* in making machines "team up"... Allis-Chalmers.

Only Allis-Chalmers Makes a Complete Line of this Equipment!

Jaw Crushers	Gyratory Crushers	Vibrating Screens	Pyro-Metallurgy
			
All-steel primary and fine reduction. ¼"-12" product.	High-speed primary and secondary. 3" to 60" size feed.	Efficient separation and dewatering — 8 different types.	Copper converters, blast & holding furnaces, accessories.

Picture!..

PROBLEMS FACING PROCESSORS TODAY—

Lagging Schedules?

Maybe you have a bottleneck machine in your plant — possibly an added machine would load up other units.

Overworked Engineers?

Outside engineering cooperation may be all that's needed to get your staff out of a hole.

ON ALLIS-CHALMERS!

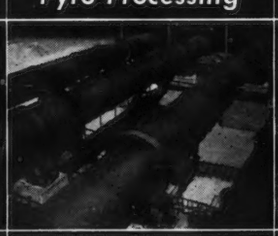
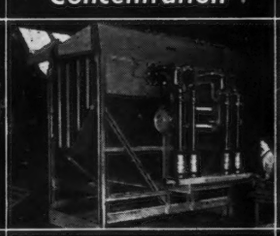
Here's a company that engineers and builds *all types* of basic processing equipment . . . in the *complete line* highlighted below.

Thus when you call on Allis-Chalmers Cooperative Engineering, you deal with engineers who are "complete line" engineers. They know *all* phases of the basic processes . . . how they all *fit together*.

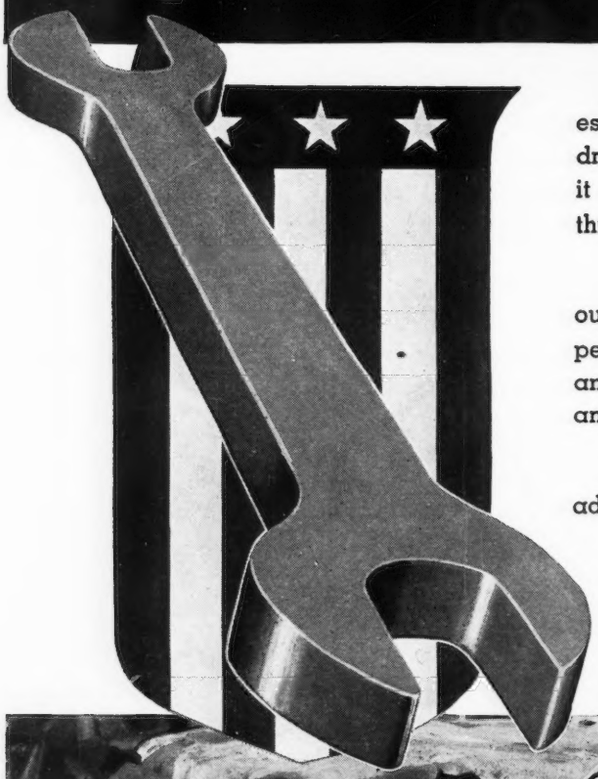
Result: you get recommendations that make existing equipment "team up" better . . . to give you greater wartime production.

Don't let another day go by without putting Allis-Chalmers Cooperative Engineering to work on *your* problem. No obligation, of course. Call your nearby A-C district office. Or write ALLIS-CHALMERS MFG. CO., MILWAUKEE, WIS.

A 1562C

Grinding Mills	Pyro-Processing	Concentration	Motors & Drives	Centrifugal Pumps
				
30 types — over 3600 in service on every material.	Kilns, coolers, dryers, roasters engineered in all types.	Complete line for extracting values from any known ore.	Unbeatable team—Lo-Maintenance Motor & Texrope V-belts.	Largest line, highest efficiencies — built with motors.

Adjust Yourself to Victory



To keep your excavator operating efficiently over the longest possible period, adjustments must be made promptly. A dragging clutch not only wears out its band too soon, but it steals power, and may result in unnecessary stresses throughout the parts functioning in the operating cycle.

Improper adjustments may not show up at once in output figures because a skillful operator can often compensate for them. In the long run, however, repair costs and delays resulting from poor adjustments will cut output and increase costs.

The time required to keep all parts of your excavator adjusted correctly will be more than repaid in decreased power consumption and lower maintenance costs.

Follow your manufacturer's recommendations for care and maintenance carefully and you will keep your excavator going at top speed for Uncle Sam.

Bucyrus·Erie

SOUTH MILWAUKEE, WISCONSIN

Enlarged reprints of this ad are available for your bulletin boards. In the reprints, the Bucyrus-Erie signature is omitted to leave room for your own name. Write for your copies.

96 POUNDS OF STOPER STAMINA

AND stamina is a necessity in rock-drilling equipment today. Keeping up with production schedules requires dependable machines that can stay underground, on the job, for months at a time. It takes machines like the Sullivan S-91 Stoper, capable of doing the work of larger, heavier stopers, to meet these schedules.

The "extra" performance you expect from a Sullivan S-91 is the result of modern design and construction. The S-91 is equipped with the famous Sullivan "Dual-Valve" and has rigid, one-piece, head-block construction that assures positive alignment and reduces side-rod stress.

The same quality construction can be found in the Sullivan Safety Stoper, the T-350 Drifter, and the entire Sullivan line of modern rock drills.

THE S-91 STOPER

Is self-rotated, and has shake-proof throttle handle, positive rotation release and rigid, tight joints throughout.

SULLIVAN MACHINERY COMPANY

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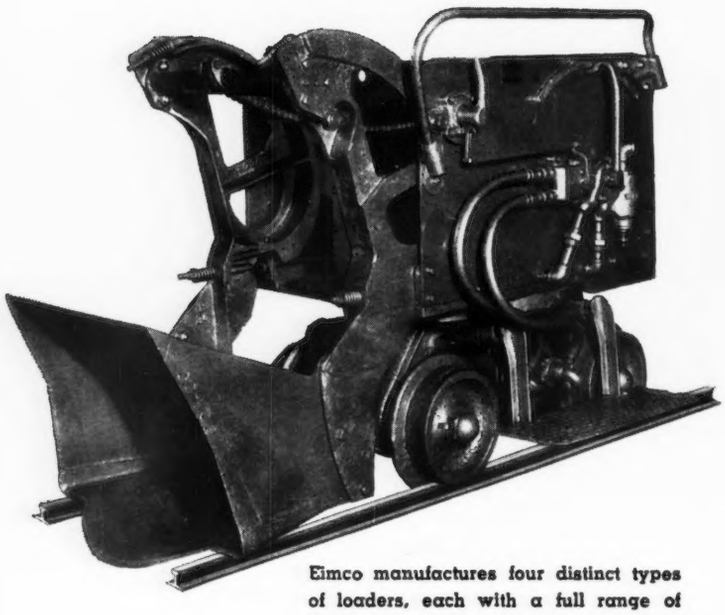
ROCK DRILLS • AIR COMPRESSORS • SCRAPER HAULERS • HOISTS • LOADERS • CORE DRILLS • CORE DRILL CONTRACTING

Eimco Loaders at

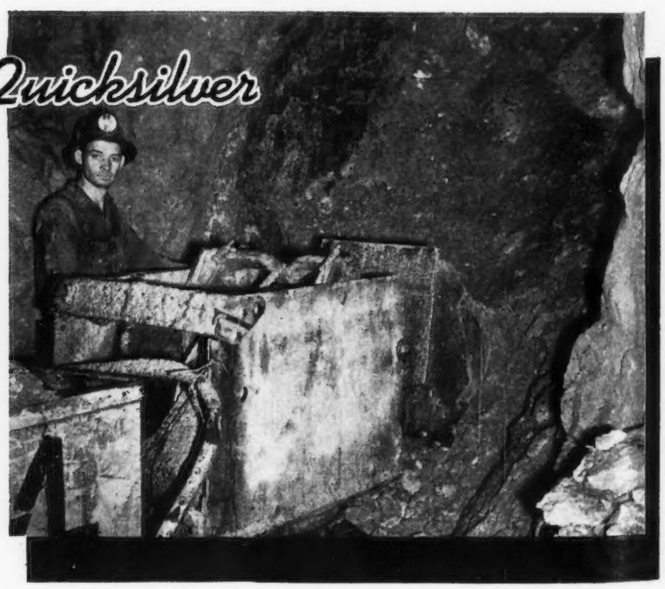
in production of strategic metals



Eimco manufactures four distinct types of loaders, each with a full range of bucket discharge heights, headroom heights, and track gauges. Above is illustrated the Eimco Model No. 21.

When Army and Navy officials requested operators of strategic metal mines to produce large quantities of ore, THE EIMCO LOADER was the one reputable machine on which mine operators could depend. Production figures at properties using the Loaders were so encouraging that now practically every progressive mine employs one or more EIMCO loaders. EIMCO loaders are self propelled, backward and forward and embody such features as: patented rocker arms, adjustable digging widths, two especially designed, powerful five cylinder air motors and many other features found in no other loaders of their type. Illustrated Bulletin No. 105 describing the EIMCO loaders and their many applications in modern mines and tunnels will be forwarded upon request.

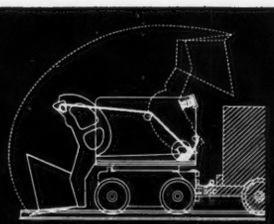
To load cars quickly, evenly, and without spillage is characteristic of the Eimco Loader, and essential to strategic metal production.



This picture shows a loader in a shrinkage stope where Eimco Loaders have been able to maintain remarkable tonnage production.

OUR GUARANTEE

The inherent superiority of Eimco Loaders has been so thoroughly proved that every machine sold now carries a positive money-back guarantee that it will outlast and out-perform any other mucking machine of comparable size and type at any air pressure, and under any working condition.



EIMCO PATENTS

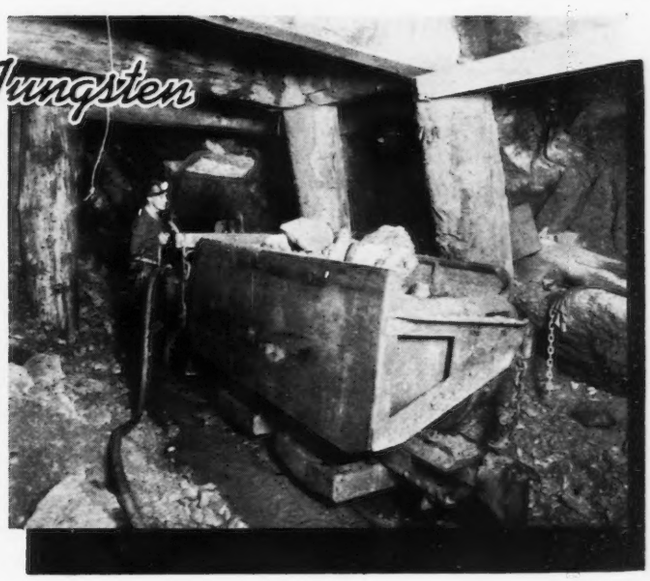
Give exclusive rights to the use of any rocker-arm profile other than a segment of a true circle and to the use of any rocker-arm which rolls on a supporting track or bed. No other known method for controlling the action of a mucking machine permits such simple sturdy construction or gives such high operating efficiency.

the front . . .

Eimco Loaders are the answer to stope and raise cleanup. Eimco No. 12 does it better than a ton a minute—don't bother with chutes.

Eimco Loaders are able to maintain your schedule regardless of the way the ore breaks—Eimco Loaders handle the big ones easily.

Mining Companies in our Allied Countries have found the Eimco Loader of essential importance in production—and the natives take to them.



Eimco No. 21 handles ore at better than two tons a minute. Eimco Loaders will load the longest cars—full—all the way back.

THE EIMCO CORPORATION

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111 W. Washington St.

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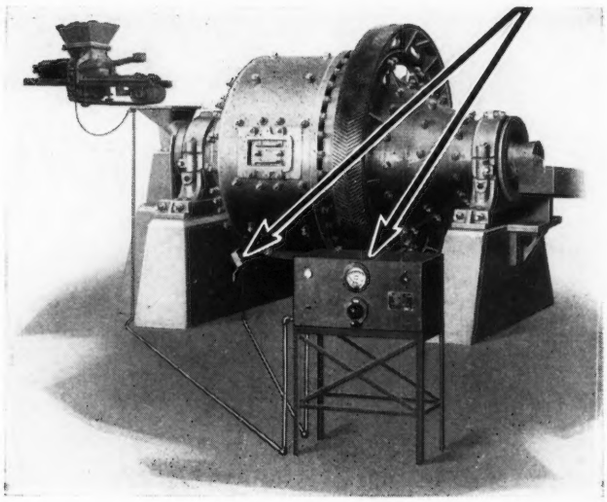
"ELECTRIC EAR"* Sound Control Unit



Will squeeze another 7% to 15% out of your Ball-Tube-Rod Mill

HARDINGE EQUIPMENT

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The "Electric Ear"* controls the mill feeder by sound. The sound varies with feed size, hardness, moisture and inadvertent changes in normal feed rate. No other means of control, manual or automatic, can cover all these variables **the moment conditions change.** That is why this simple device—installed without stopping the mill—is so successful and so valuable when every ounce possible must be squeezed from all equipment processing basic materials.

Write for Bulletin 42

*Reg. U. S. Pat. Office

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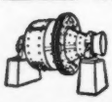
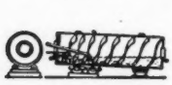
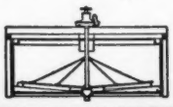
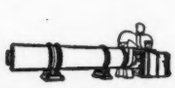
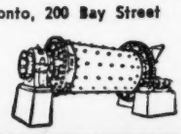
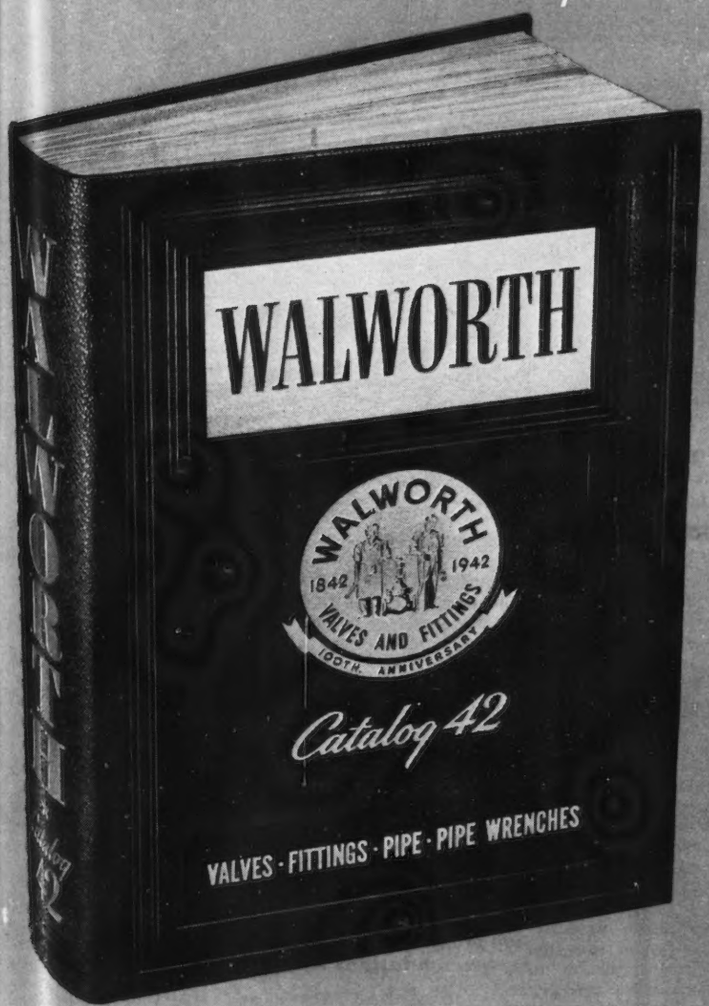







CONICAL MILLS | COUNTER CURRENT CLASSIFIERS | THICKENERS CLARIFIERS | RUGGLES-COLES DRYERS | CONSTANT WEIGHT FEEDERS | TUBE ROD AND BATCH MILLS

Specify FROM THE NEW WALWORTH Catalog 42 and be sure!

HERE'S THE COMPLETE UP-TO-DATE DATA ON VALVES, FITTINGS AND PIPE



1. **METALS** — complete data on all types used including conformity with A.S.T.M., Marine and U. S. Navy specifications.

2. **PRESSURES**—working and test pressures; plus service recommendations.

3. **DIMENSIONS**—complete for layout and operation with cross sections to clarify internal construction.

4. **ENGINEERING DATA** — charts, tables, formulae to make valve and pipe installations easier.

5. **TELEGRAPHIC CODE**—carefully indexed to simplify and speed up accuracy in specifying.

Your new Walworth Catalog 42 is off the press. Clearly indexed and detailed so as to be most useful, it gives the last word on any question concerning our products.

Priorities on transportation may delay the receipt of your copy but we are doing everything possible to expedite delivery.

WALWORTH

WALWORTH COMPANY
60 EAST 42nd STREET, NEW YORK

VALVES
FITTINGS
and TOOLS
Backed by 100 Years' Service

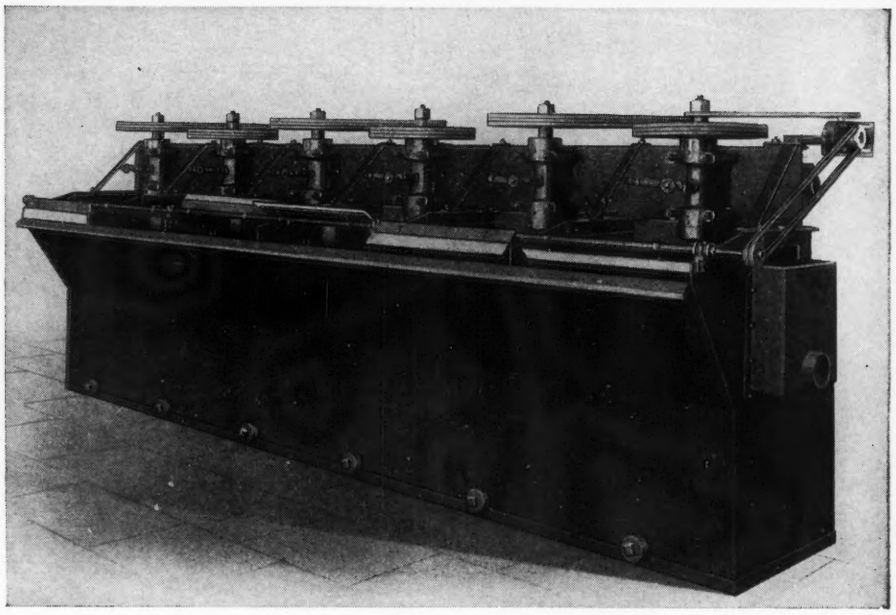
DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

MORSE-"WEINIG" CELLS

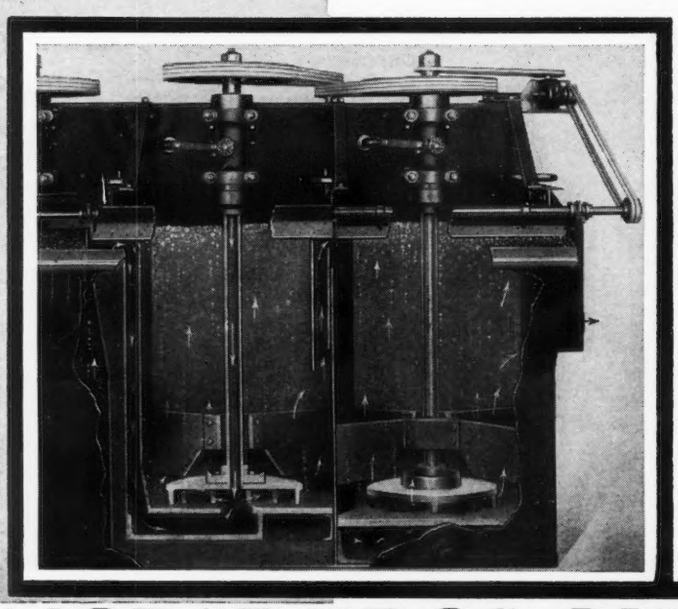
Give Better Flotation Results!

Every exacting flotation operator appreciates the importance of controlled air to attain the best results in flotation. The exclusive Morse-"Weinig" principle, for delivery of air down through the hollow impeller shaft to the critical point in the mixing zone at the center of the impeller, is clearly shown in the illustration below. This feature, in itself, has created great demand for the Morse-"Weinig" Flotation Machines.

Patents Applied For and Pending



6-Cell No. 40 Morse-"Weinig" Low Head Flotation Machine



Positively controlled air, intimately and thoroughly mixed with the pulp at the center of the Morse-"Weinig" Impeller, is an exclusive feature of the Morse-"Weinig" Flotation Machines. Air control valves are accessibly located on impeller housings so each distinct cell may have the exact amount of air to attain highest efficiency and best results. Morse-"Weinig" Cells are manufactured of heavy and quality materials and equipped with hand regulated weir gates to control pulp level in each separate cell. They are also made with float valve pulp level controls for the rougher and cleaner sections of each machine. Either type of construction is optional according to the wishes of the user.

Morse-"Weinig" Flotation Cells are manufactured in a number of sizes ranging from 6 to 75 cu. ft. volume per cell. Submit details of your flotation problem so prompt and complete recommendations may be offered.

• **WRITE FOR NEW FLOTATION BULLETIN NO. 402**

MORSE BROS. MACHINERY CO.

ESTABLISHED 1898

MB

P. O. BOX 1708 • DENVER, COLORADO, U. S. A. • CABLE "MORSE"

1775 BROADWAY, NEW YORK CITY

HEAD, WRIGHTSON & CO., LTD., STOCKTON-ON-TEES, ENGLAND

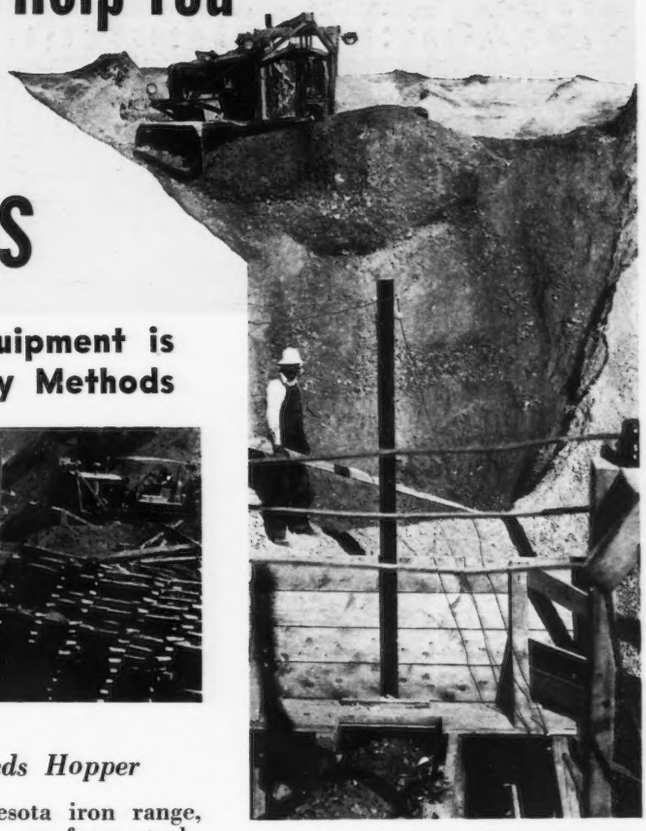
HEAD, WRIGHTSON & CO., (S.A.) LTD., JOHANNESBURG, SOUTH AFRICA

PERRET & BRAUEN, CAIXA POSTAL 3574, SAO PAULO, BRAZIL, S. A.

BUCCHI C. & CIA. LTDA., CASILLA 157-D, SANTIAGO, CHILE, S. A.

PERRET & BRAUEN, CAIXA POSTAL 288, RIO DE JANEIRO, BRAZIL, S. A.

LeTourneau Dozers Can Help You Whip Your Ore-Handling Problems

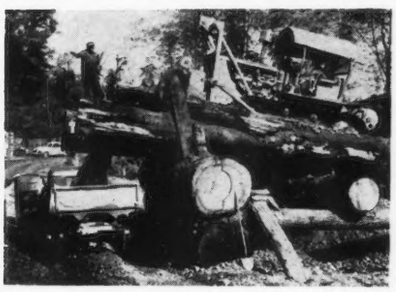


On a 50-foot shove, this LeTourneau Angledozer and "Caterpillar" D8 tractor averaged a load delivered to the hopper every minute. On jobs like this, if you will work your Dozer in one blade-wide cut, or "slot," cut sides will act as side-boards, will keep material from windrowing off ends and will enable your Dozers to move more yardage per load.

When Heavy, Expensive Loading Equipment is Difficult to Get, Try These Emergency Methods

Scores of smart mining companies have long used LeTourneau Dozers for clearing, pioneering roads and cleaning up around pits and mines. Today—to make the most of the equipment and materials they have on hand—many use their Dozers to maintain uninterrupted ore production on emergency jobs where bigger equipment is not immediately available. For example:

Loads Trucks by Ramp



To load trucks without the expense and delay of bringing in shovels, this company built an emergency loading ramp of logs. A LeTourneau Bulldozer and "Caterpillar" D7 tractor brought material from nearby creek bed, dozed it up the ramp and into 3-yard trucks at the rate of 106 truck loads every 8 hours.

Dozer Feeds Hopper

On the Minnesota iron range, this outfit feeds ore from stockpile to plant by means of dozing through a field hopper onto conveyor belt. Same LeTourneau Bulldozer is used to move waste rock from the plant.

Rugged, Long-Lived Construction

Your LeTourneau-"Caterpillar" dealer can give you many more ideas on how LeTourneau Dozers can save time, money and extra equipment on your ore-handling jobs. LeTourneau Angledozers and Bulldozers are stoutly built by electric arc welding, to handle tough jobs like this with a minimum of time out for repairs. And you have the extra advantage of prompt service and repair parts from LeTourneau - "Caterpillar" dealers in strategic cities the world over.

Let your nearest dealer help you plan your mining operations for big-yardage emergency use of tractor equipment to fill your present needs when special loading equipment is not available. See him today.

LeTourneau Power Units Give You Steady, Big-Yardage Performance

Another big advantage of LeTourneau Dozer operation, is its dependable, fast-acting cable control, pioneered by LeTourneau. Powerful, instant operation is assured in all climates—no leaky hoses, no oil to thin and bypass with heat or slow up and stop in subzero temperatures. Easy, safe to operate. Simple to adjust.

Increase Tractor Usefulness

All LeTourneau units operate by LeTourneau cable control; thus, the same tractor and 2-drum Power Unit used for dozing can be combined with a LeTourneau Rooter, to save blasting in hard, rocky excavation. Or with a front-mounted Power Unit to operate Dozer, the rear of tractor is left free for mounting 2-drum Power Control Unit for stripping with Carryall Scraper . . . for hauling ore from shovels with Tournatrailers . . . or for fast handling of your heavy lifting jobs with a LeTourneau Crane.

Over 25,000 LeTourneau PCU's

All these money-making advantages—plus rugged, long-lived construction by electric arc-welding, have sold more than 25,000 LeTourneau PCU's to contractors, miners, operators and armed forces—men who know equipment best.

LETOURNEAU

PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

Manufacturers of DOZERS, CARRYALL* SCRAPERS, POWER CONTROL UNITS, ROOTERS★, SHEEP'S FOOT ROLLERS, TOURNAPULLS★ TOURNAROPE★, TOURNATRAILERS★, TOURNAWELD★, TRACTOR CRANES. **Name Reg. U.S. Pat. Off.*

"...tramp iron doesn't bother us... source of grave trouble" eliminated

Telephone SUtter 6631

Properties
Comstock Lode, Storey County, Nevada

CONSOLIDATED
CHOLLAR GOULD & SAVAGE MINING COMPANY
1122 KOHL BUILDING
SAN FRANCISCO, CALIFORNIA

September 28, 1942

Mines Engineering & Equipment Co.,
369 Pine Street,
San Francisco, California.

Gentlemen:

We are sending you under separate cover, one eight-pound hammer head and two picks which passed through our Secondary Crusher on September 18th, without apparently doing any damage.

This is such a remarkable demonstration of the power and efficiency of your 48" TELSMITH Gyrasphere Secondary Crusher, that we feel you should have these specimens as proof of the statement. This machine, at the time, was set for one-half inch discharge, which makes the demonstration more remarkable.

We get a large percentage of tramp iron in our mill feed owing to the fact that our surface operation has penetrated some old stopes. In the past this was a source of grave trouble but since installing your machine, tramp iron doesn't bother us. This statement, however, doesn't include eight-pound hammer heads as there must be a limit to the endurance of even a Telsmith.

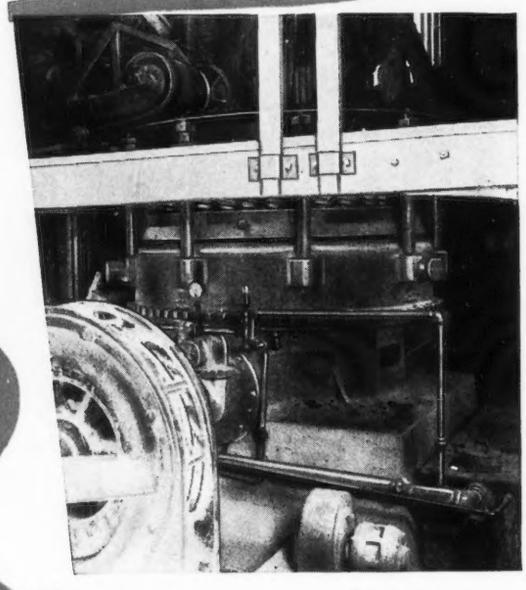
You are at liberty to quote us on the excellent performance of this machine as we feel by our actions, we are only giving credit where credit is due.

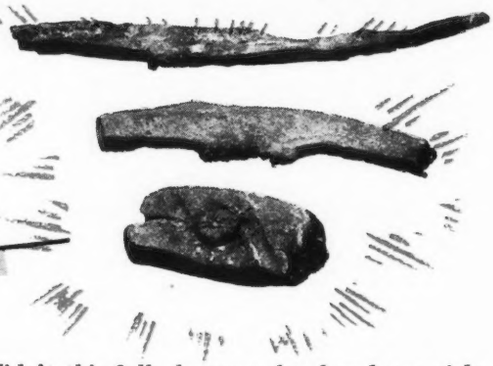
Very truly yours,

CONSOLIDATED CHOLLAR GOULD
& SAVAGE MINING COMPANY

By Thomas V. Barton
Thomas V. Barton
Vice-President
&
General Manager

TVB:RVC





TELSMITH Gyrasphere SECONDARY CRUSHER

★ *Why didn't this 8-lb. hammer head and two picks even stop this crusher?*

Because of Telsmith's *spring relief*. The concave bowl is backed by heavy springs, adjustable as to compression. When tramp iron gets in, it causes undue pressure in the crushing bowl. The springs let the concave bowl *tilt* at the point of stress. The pressure is relieved.

The concave resumes its normal position. Crushing goes on as usual. The same "relief" is afforded when crusher bowl is packed by fines. This means greatly increased capacity in fine crushing, continuous operation with entire freedom from expensive shut-downs, and a minimum of maintenance expense. *For the whole story, get Bulletin Y-1.*

MIN. 13

SMITH ENGINEERING WORKS, 502 EAST CAPITOL DRIVE, MILWAUKEE, WISCONSIN

Cable Addresses: Sengworks, Milwaukee—Concrete, London

EXPORT OFFICE: 770-A Hudson Terminal Bldg., New York

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Armco International Corp. Buenos Aires, Argentina
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Room 1604-50 East 42nd St. New York City
211 W. Wacker Drive Chicago, Ill.
Mines Eng. & Equip. Co. San Francisco, Calif.

Canadian Vickers, Ltd., Montreal; Gordon Russell, Ltd., Vancouver. General Agents for Western States: Mine & Smelter Supply Co., Denver, Salt Lake City, El Paso

Son...

HE has just turned eighteen. Shaves twice a week and maybe a hair or two is sprouting on his chest. He shies away now when his dad tries to be affectionate and we noticed some lipstick on one of his handkerchiefs after a country club junior dance not so long ago. But it seems only yesterday, perhaps it was the day before, that he was a chubby legged kid swinging from the arch of the doorway, leading to the dining room, in a gadget that was something like a breeches buoy and he was sucking at the end of a turkey bone.

He went back to school this Fall, a tall, athletic lad, budding into manhood, but there was something else on his mind beside the football and hockey teams or the little blonde girl with whom he had "palled" around during the Summer. It seems as though he was listening for a certain call—the Clarion call that poets sing about—and, perhaps we just imagined it, but we thought we saw an upward jutting of his chin, a certain light in his eyes, and a sort of a rearing-to-go expression in his face.

It chilled us a bit in the region of our heart, when we thought of his discarding the sports coat for the "O.D." of the Army or the blue of the Navy. There was a bit of a catch in our throat as we thought of his putting aside his football helmet for one of steel; of his hanging up his hockey stick and reaching for a gun. After all we still regard him as just a little boy.

They tell us that the eighteen and nineteen year old lads are to be called to the service. When that day comes to us there will be prayers, but no tears. We shall not mourn nor shall we be fearful. Rather there will come welling up from our hearts that warm feeling of pride that millions of other parents will sense when their beloved lads marched away. Our lad is no different than the others. We are no different than other loving parents, nor is our sacrifice any greater. They are going to make great soldiers, sailors, marines and fliers out of these youngsters. And they will become a mighty force when they take their places beside their brothers in arms. They too know what they fight for. They too know full well of the sacrifices that must be made before the evil powers that threaten the world can be overcome.

And let us not forget that they are counting on us. They know that we shall not fail them.

God be with them and their brothers.

THE CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.
REG. U. S. PAT. OFF.

Right in Our Own Backyard!

Sure, there's a pot of gold at the end of the rainbow. And just over the horizon are "acres of diamonds". But untapped mineral resources right in our own backyard? Yes, and from them the mining industry is filling the war-born demands for more and more metal for the Americas!

AMERICAN CYANAMID COMPANY

Deprived of many former foreign sources of minerals, the mining industry is called upon for larger production than ever before attempted . . . and this despite shortages of labor and supplies. To meet this demand, the mining industry of both Americas is adopting new ways and expanding existing facilities for treating larger tonnages of low-grade ores, sub-ores and waste-products.

How is this being done?

Giant strides forward are being made by the installation of new flotation capacity for treating low-grade base metal ores. Noteworthy example is the increase in capacity at the Morenci mill where new equipment, including Fagergren Flotation Machines, will more than double the estimated capacity of the original mill. Older mills, too, have expanded output through improved metallurgy and the installation of better equipment. Typical is the modernization and expansion program of the Bagdad Copper Corporation mill where output of flotation concentrates will be increased many fold.

Highly important also are the gains being made by the addition of Heavy-Media Separation Processes to preconcentrate the feed to flotation and thereby increase the output of existing mills, or to make possible the economic treatment of material hitherto considered too low-grade for concentration. Already, plants using Heavy-Media Separation Processes are being operated or being built to treat substantial tonnages of Lead-Zinc, Zinc, Tin, Garnet, Iron and Magnesite ores.

Due to the refractory nature of many domestic ores and the limited technical data available on their treatment, much research work has been necessary. In this work the Cyanamid Ore Dressing Laboratory has cooperated with the mining industry in concentrating such minerals as Illmenite, Rutile, Zircon, Garnierite, Topaz, Beryl, Brucite, Helvite, Celestite, Spodumene and Cobalt-Nickel Sulphides. This cooperative work has resulted in the construction of new concentrators — some of which are already in operation.

In the economic application of Cyanamid Flotation Reagents and Fagergren Flotation Machines; in the addition of Heavy-Media Separation to present flow schemes or its use to produce marketable concentrates; in the technical work necessary to develop new or improved techniques for treating previously unusued native minerals, the facilities and services of the Cyanamid Ore Dressing Laboratory and Cyanamid Field Engineers are at the command of the mining industry.

BALLMILLS

WET OR DRY GRINDING

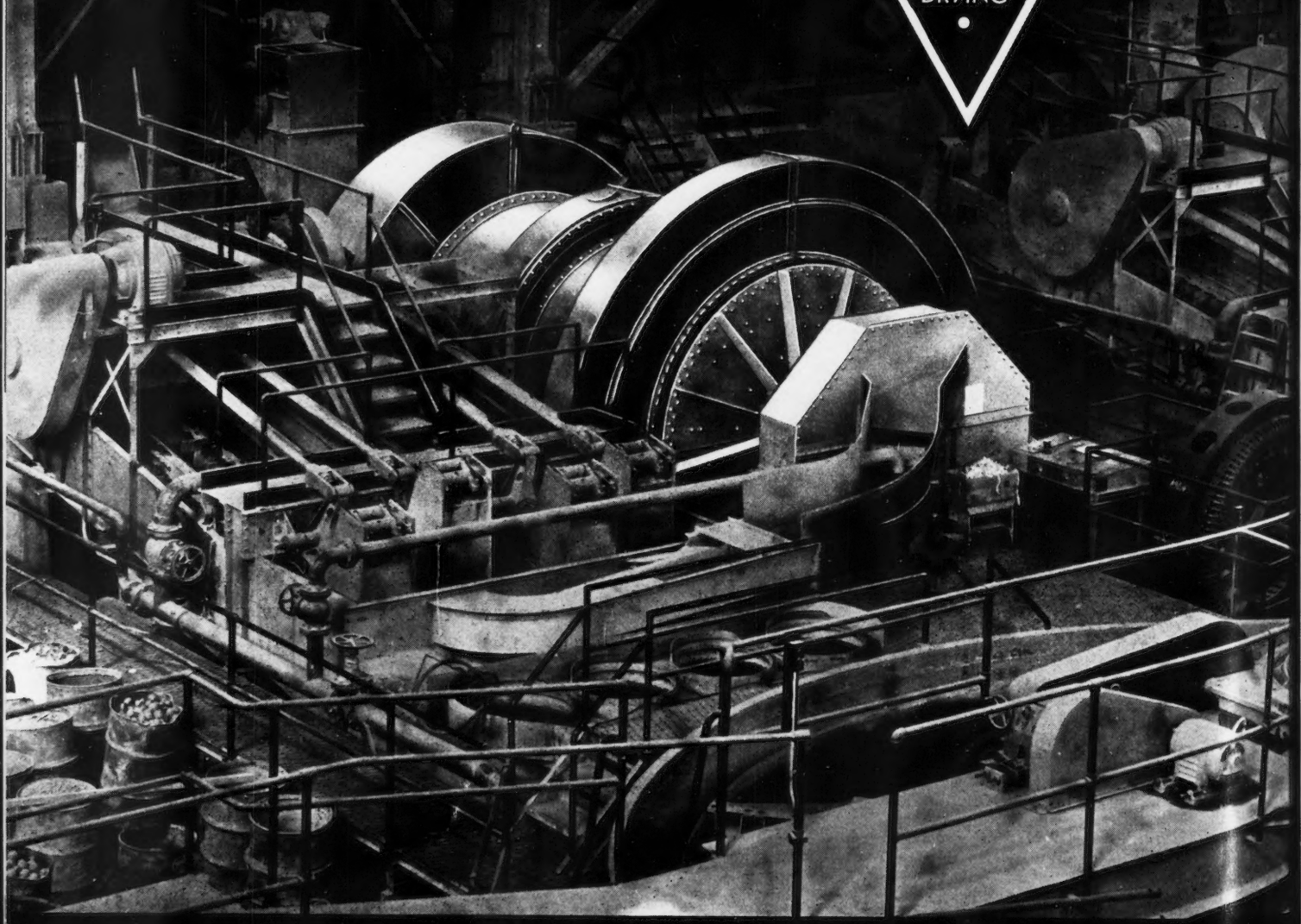
•

OPEN OR CLOSED CIRCUIT

•

ALSO AIR SWEPT FOR GRINDING AND DRYING

•



F. L. SMIDTH & CO.

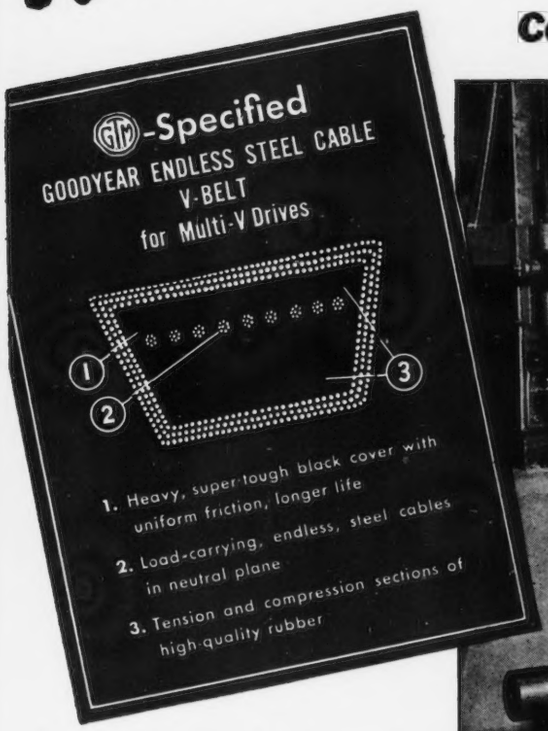
ENGINEERS
MANUFACTURERS OF BALLMILLS
SINCE 1895

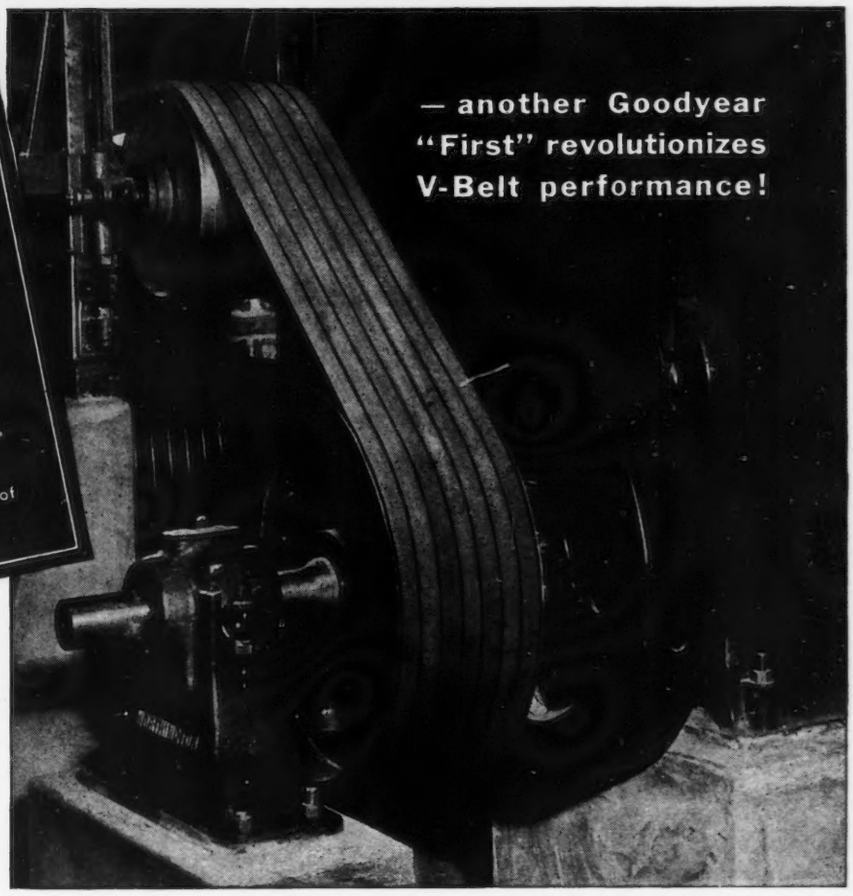
60 EAST 42ND STREET

NEW YORK, N. Y.

Here's THE ULTIMATE V-BELT

Constructed with endless steel cables


G T M -Specified
GOODYEAR ENDLESS STEEL CABLE
V-BELT
for Multi-V Drives
1
2
3
1. Heavy, super-tough black cover with uniform friction, longer life
2. Load-carrying, endless, steel cables in neutral plane
3. Tension and compression sections of high-quality rubber



AFTER many months of research, development and field operation on the hardest drives, work has just been completed on another Goodyear "First"—the V-belt of the future, built with endless steel cables in place of conventional cotton cord construction.

In exhaustive tests this new Goodyear Endless Steel Cable V-Belt has averaged more than SEVEN times longer service-life than the best cotton cord belts — with less than ⅛ of 1% stretch.

The outstanding advantages of the Goodyear Steel Cable V-Belt, the latest addition to the outstanding line of Black E-C Cord Multiple V-Belts, make it possible to engineer Multi-V drives where space limitations and other engineering factors formerly denied their usage.

Greater Strength Factor: far heavier drives can now be changed over to economical Multi-V operation.

Highest Heat Resistance: proved on U. S. Tanks.

Minimum Stretch: practically zero stretch with fewer adjustments.

Uniform Stretch: every belt takes its proportional share of the load, giving smoother operation.

Far Longer Life: lowest over-all cost for heaviest drives.

So successful is this construction proving, that new high standards are set in all phases of Multi-V drive performance and wartime production is speeded up. Its many advantages and economies are another Goodyear "First"— a triumph of G. T. M. rubber engineering — at present only available for special war jobs and critical drives for war work operation.

For complete information, consult the G. T. M. — Goodyear Technical Man — or write Goodyear, Akron, Ohio, or contact the nearest Goodyear mechanical goods distributor.

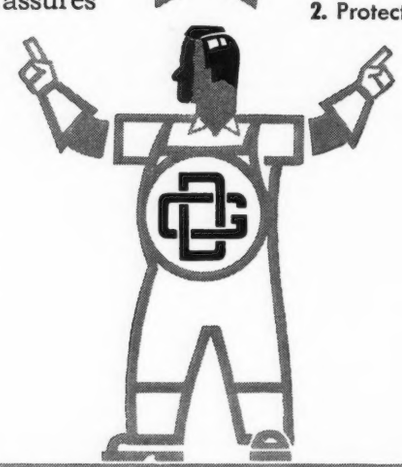
E-C Cord—T.M. The Goodyear Tire & Rubber Company

PROVED ON U. S. TANKS — ordinary fan belts "burn out" in a few hours — Goodyear Steel Cable V-Belts last months!

Our Part... AND Your Part

THE nation's metal mines have assumed the important task of producing raw metals for Victory. Our part in this effort is to help you get out more ore, faster. To this end Gardner-Denver has spared neither effort nor expense in keeping its line of drifting drills at the highest stage of development—has introduced many improved features which have contributed to drilling speed and efficiency.

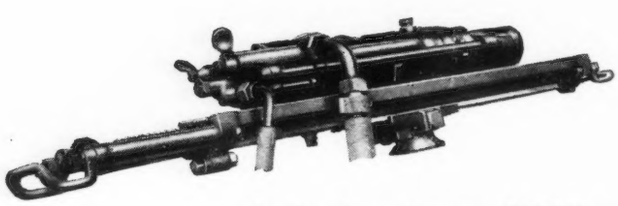
One of these is the Gardner-Denver Continuous Feed principle, which assures less vibration—far less wear—unusually low maintenance. Weight of the feed motor, built into the drill proper, dampens destructive vibration—and the slowly moving piston feed motor, which makes only two and one-half strokes per inch drilled, reduces wear and maintenance to the minimum.



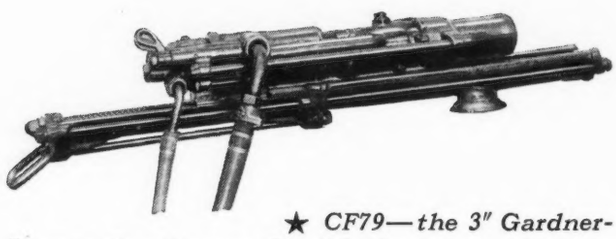
YOUR Gardner-Denver rock drills are made from scarce materials—alloys of nickel, chrome, molybdenum, vanadium—high strength alloys that make possible the modern high performance of rock drills.

And so it is the patriotic duty of users of rock drills to get the most work and longest life out of them, and to:

1. Provide proper and adequate lubrication with an oil of high film strength.
2. Protect them against the entrance of abrasive cuttings into the working parts.
3. Take precautions against abusive handling.
4. Use air supply lines of adequate size, and keep them free from restrictions and free from leaks.
5. Use only drill steel with shanks accurately formed to the proper dimensions.
6. Keep all drills in good repair to minimize consumption of repair parts.



★ *Gardner-Denver CF89H—the 3½" Gardner-Denver Continuous Feed Drifter.*

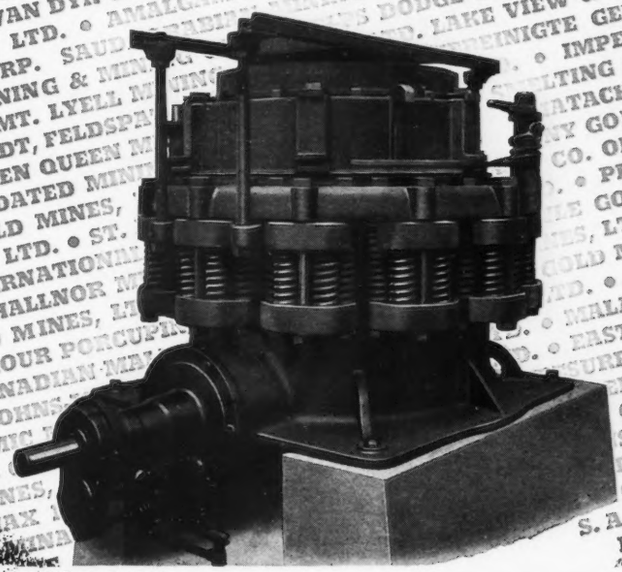


★ *CF79—the 3" Gardner-Denver Continuous Feed Drifter.*

GARDNER-DENVER PRODUCTS HELP SPEED VICTORY

Write for a bulletin giving complete information on Gardner-Denver Continuous Feed Drifters. Gardner-Denver Company, Quincy, Illinois

GARDNER-DENVER *Since 1859*



FINER MILL FEEDS MORE ECONOMICALLY PRODUCED

Fine mill feeds minus 3/8 - 5/16 - 1/4 inch and even smaller sizes can be more economically produced in the Symons Short Head Cone. Hundreds of installations of Cones throughout the world have proved that *it costs less to crush to these sizes than it does to grind.*

NORDBERG MFG. CO.
MILWAUKEE WISCONSIN

NEW YORK LOS ANGELES LONDON TORONTO

SYMONS CONE CRUSHER

Short Head Type

Peaks and Valleys. It is reliably estimated that not less than 25% of the men usually engaged in mining have left the field . . . right at the moment that production demands have reached their all-time peak. This means new men—greater demands upon the remaining men. This means also appreciation of the simpler maintenance required by alkaline batteries. New men learn about their care quicker . . . the hazards of damage in unskilled hands are less.

$5,000 per Breakdown. Coal Age quotes one mine operator as saying, "I've seen it cost as high as $5,000 for a mechanical or electrical breakdown. It may run higher than that when you've got 200 men underground." The gentleman pointed a moral: the chance of a breakdown in haulage due to power failure is practically nil when the haulage unit is powered by an alkaline battery.

Price isn't Cost. Dramatic lessons are being taught today in *real costs*. It's true that the Edison Alkaline Battery is the highest-priced battery on the market. But in day-to-day operation it proves the greatest of economies because it keeps the production flowing out, is almost never off the job for repairs, lasts the longest. Thus in point of real costs it is the *bargain* among batteries.

Edison Storage Battery Division
Thomas A. Edison, Inc.
WEST ORANGE, N. J.

DURATION POWER

No one can predict how long this war will last—how long the necessity for peak production in mines will go on. But one prediction will certainly come true: the storage batteries *most* likely to last for the duration will be of the alkaline type . . . are the *least* likely to need replacement.

Endurance and dependability are literally designed into Edison Batteries. Electrochemically and structurally they are built to last a long time, to do a lot of hard work, to take severe punishment and to require very little maintenance. The result has been that where they are handling the power job in locomotives and shuttle cars that job is going well. Their efficiency is directly allied to the flow of war production.

MINING NEEDS THE DEPENDABILITY OF

Edison Alkaline BATTERIES

For Driving Drifts In Metal Mines

CONWAY SHOVELS

The Type 125 Conway shovel mucks headings at a rapid rate, even where clearances are limited, and by means of the rear conveyor loads long cars to full capacity.

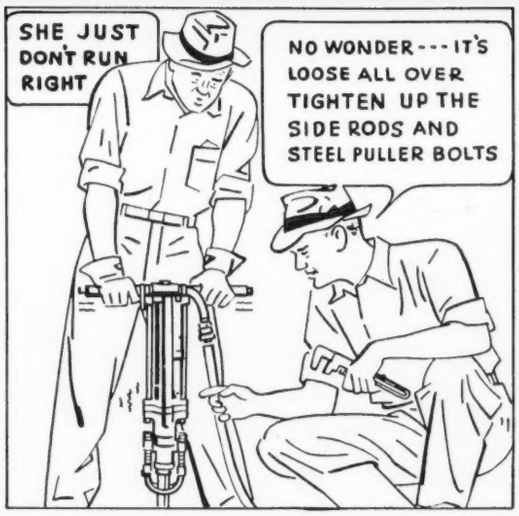
For complete details consult a Goodman sales engineer.

GOODMAN MANUFACTURING COMPANY

HALSTED STREET AT 48TH • CHICAGO, ILLINOIS

HOW TO KEEP *YOUR* ROCK DRILLS *on the Job*

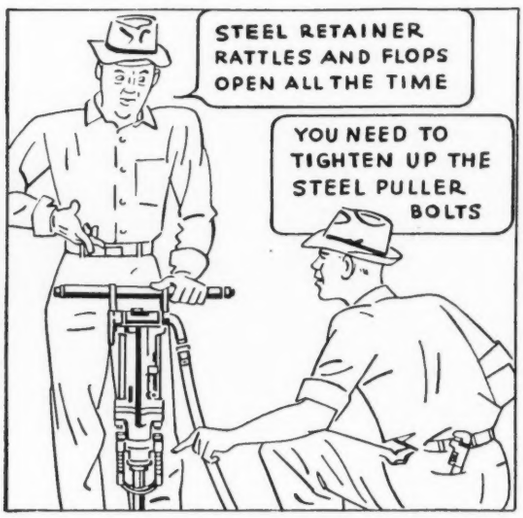
Don't use dull drill steels — When the bit, from wear, or improper sharpening loses its gauge, it will no longer be free in the hole and the blows of the hammer wedge it tightly, greatly slowing up, if not entirely stopping the progress of the drill. Never use dull steel. You get no drilling to speak of, and you put your machine in the repair shop besides.



Keep the drill tightened up—Watch the nuts, bolts, and oil plugs on your machine, particularly the side rods. Permitting them to work loose allows excessive play between the parts, and this means early wear and loss of air as well.

★ Another in a series of advertisements telling how to get maximum work out of your drills, with minimum expense for repairs and compressed air. Send for the whole series, ask for "Cleveland Cartoons".

BUY WAR BONDS



Steel Puller will work perfectly if kept tightened up—Some steel pullers—those on Cleveland Sinkers, for example — are so constructed that it is easy to take up the looseness which may be present when the springs have taken a set. Keeping all these parts tight will make the machine last longer.

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CANADIAN DISTRIBUTORS

Purves E. Ritchie & Son, Ltd., 658 Hornby St., Vancouver, B. C.
Whitehall Machine & Tools, Ltd., Galt, Ontario

THE CLEVELAND ROCK DRILL COMPANY

Subsidiary of The Cleveland Pneumatic Tool Company

CABLE ADDRESS: "ROCKDRILL" • CLEVELAND, OHIO

LEADERS IN DRILLING EQUIPMENT

On a Sunday morning twelve months ago, America got out of bed and yawned and breakfasted, went to church and read the funnies or took a walk with the kids. We were a big, sleepy, good-natured people who only half believed that such things as war existed.

A few hours later we were awake. The thing that made us awake was treacherous and brutal, but the shock of it was as bracing as an icy shower. We knew, at last, where we stood and what we had to do.

THAT WAS A YEAR AGO...

YOU have a broad idea of what the nation has accomplished in this first year of war. We now report to you on what the men of one company have done and are doing.

Long before last December, "Caterpillar" Diesel Tractors and Motor Graders, Engines and Electric Sets were busy on what was then called "defense" work. With the country's entry into war, "Caterpillar" production was turned wholly to war purposes, and our plants, already working three shifts a day, stepped up their output of machines. Additional space was built. More workers were trained.

Throughout this crucial year, 100 per cent of this increased "Caterpillar" production has been going into the war effort — the vast majority of it directly to the *combat forces* of the Army, Navy and Marine Corps, and for our fighting allies. On all the world's battlefronts these machines are right in the thick of the struggle for freedom. "Caterpillar" Diesel equipment is clearing beachheads for attack troops, hauling big guns, building and repairing landing fields, drilling wells and pumping water. It is powering naval craft and generating current for lights and communications, afloat and ashore. But our report would be far from complete if it dealt only with combat activities. Here at home, thousands of older "Caterpillar" machines have been performing what appears to be a miracle. With no new machines coming from the factory to replace them — with fewer men to do the vital wartime jobs, and with heavier loads and longer hours a necessity — they have stood up under grueling punishment, month after month. In industry and construction, in mines and lumber camps and on the farms, "Caterpillar" Diesels are making a mighty contribution to the war effort.

They're no orphans — these tough, veteran machines. They are under able and expert guardianship. Back of their record of performance stand the "Caterpillar" dealers who have met the challenge of this emergency with energy and courage, and have shouldered full responsibility for keeping "Caterpillar" Diesel equipment doing its sturdy best.

With a large supply of replacement parts in their stock rooms, and with complete service facilities available night and day, "Caterpillar" dealers everywhere are pledged to keep "Caterpillar" Diesel Tractors, Graders, Engines and Electric Sets delivering all of the long life and rugged dependability that are built into them — until victory is won.

CATERPILLAR DIESEL

REG. U.S. PAT. OFF.

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

TO WIN THE WAR: WORK—FIGHT—BUY U. S. WAR BONDS!

For All-Out Metal Production

TOO MUCH . . . TOO SOON . . .

Our Metallurgical Division Offers SPEED and ACCURACY in ORE TESTING and METALLURGICAL SERVICE.

Service that has already provided increased production in existing plants for COPPER . . . ZINC . . . TUNGSTEN . . . ANTIMONY.

Our Laboratory is equipped for batch and pilot plant ore testing.

WRITE, WIRE OR PHONE FOR PARTICULARS

★ *"THERE IS NO SUBSTITUTE FOR EXPERIENCE AND SERVICE"*

THE GALIGHER COMPANY 48 SOUTH SECOND EAST, SALT LAKE CITY, UTAH

Only JACKBITS offer these 3 advantages

1

THE RIGHT DESIGN OF JACKBIT FOR EACH ROCK DRILLING JOB

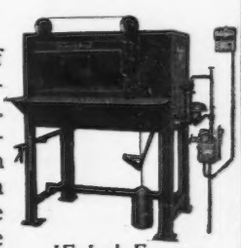
Only Ingersoll-Rand Jackbits cover the complete size range from 1⅜ to 4½ inches. From the many different designs you can select a bit that will give you the best drilling efficiency in any kind of rock. There are bits developed especially for the hardest rock... for abrasive or sticky ground... for ground that tends to rifle or that binds the bit... for ground that requires maximum bit clearance.

All plants of Ingersoll-Rand Company are flying the Army-Navy "E" awarded "for high achievement in the production of war materials."

2

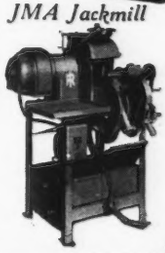
THE *only* COMPLETE LINE OF RECONDITIONING EQUIPMENT

JMA Jackmill



JF Jack Furnace

Experiences of hundreds of users show that Jackbits reduce over-all drilling costs. But, as rock drill manufacturers, we know that maximum savings are possible only when you use the right bit for the job and also the most suitable reconditioning equipment. That is why we developed both Grinders and Hotmills for resharpening bits, a Thread Forging Device for forming threads on I-R Sharpeners, a complete line of Furnaces and Accessory Equipment.



J3 Jackbit Grinder

Drill Steel Sharpener

3

ROCK DRILLING SPECIALISTS TO ASSIST YOU

We have a number of men who have had wide experience in applying Jackbits to all types of mining and construction jobs all over the country. These men have a thorough background of rock drilling knowledge and are available to help.

Remember, only with JACKBITS do you get these 3 basic essentials of faster and lower-cost drilling

SOLVE YOUR DRILLING PROBLEMS WITH IR JACKBITS

Ingersoll-Rand

11 BROADWAY, NEW YORK CITY

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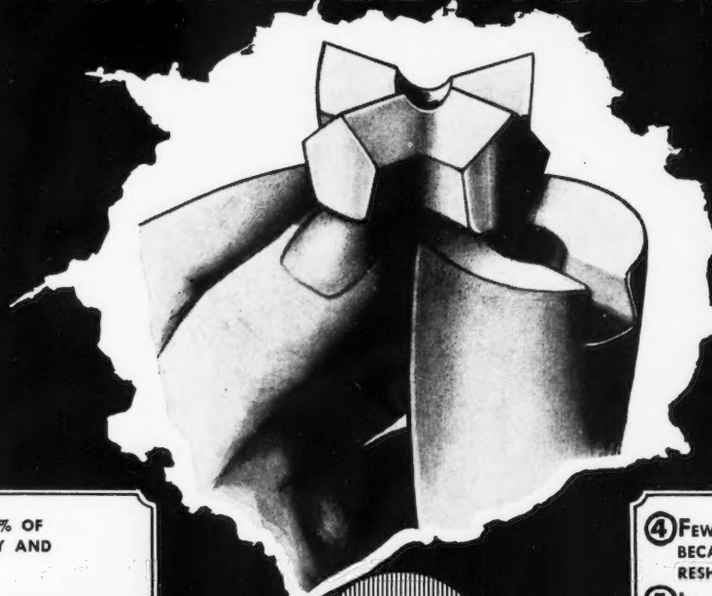
ANNOUNCING

the SEVEN Points OF EFFICIENCY OF

EDWARDS

DETACHABLE ROCK BITS



Write for Catalog

1. SAVE UP TO 90% OF STEEL INVENTORY AND CIRCULATION
2. BITS EASILY REMOVED FROM SHANK — CHANGE WITHOUT TOOLS NO LOST BITS IN HOLE — MINIMUM SHANK BREAKAGE
3. THE ONLY BIT THAT CAN BE RESHARPENED BY FORGING
4. FEWER REPLACEMENTS BECAUSE NO METAL LOST IN RESHARPENING
5. INCREASED TONNAGE AT LESS COST
6. UPSET DIAMETER OF SHANK STRENGTHENED AT POINT WHERE MOST DETACHABLE BIT SHANKS FAIL, JUST BELOW THE BIT
7. LESS COMPRESSED AIR USED — LESS DUST CREATED

ED-BIT

MANUFACTURED BY

AMERICAN MINING AND RESEARCH CORP.

» EAGLE AND LAWRENCE ROADS · UPPER DARBY · PENNSYLVANIA «

PHONE: HILLTOP 6166

MADE IN CANADA (UNDER SAME PATENTS) BY HAYES STEEL PRODUCTS LIMITED, MERRITTON, ONTARIO.

A BETTER MINING SHOVEL

Because OF THIS COMBINATION OF ADVANTAGES!

- SIMPLICITY OF DESIGN
- "FEATHER-TOUCH" CLUTCH CONTROL
- CUSHION CLUTCH
- WORM BOOM HOIST
- CAST STEEL BASES
- HELICAL GEAR DRIVE
- UNIFORM PRESSURE SWING CLUTCHES
- SPLINED SHAFTING
- BALL OR ROLLER BEARINGS
- LARGE CLUTCHES
- EASY STEERING
- CRAWLER GEARS EN- CLOSED
- SMALL CRAWLER ROLLERS
- NO NUT CRACKER CRAWLER ACTION
- CHAIN DRIVE TO CRAWL- ERS
- DUAL INDEPENDENT CROWD
- DIPPER STICKS TIED TO- GETHER AT INNER END
- WELDED BOOM AND DIP- PER STICKS
- DEMOUNTABLE LAGGING

ADD this up! It's a combination of features that is hard to equal. They mean speed and output, and many of them are found in no other make of machine. Think over the machines you are now using. How many of them have any of these advantages? Kind of keep that back in your mind for the future.

NORTHWEST ENGINEERING COMPANY
1806 Steger Bldg. • 28 E. Jackson Blvd. • Chicago, Ill.

NORTHWEST

BUILT IN A RANGE OF 18 SIZES—3/8 CU. YD. CAPACITY AND LARGER

If it's a real Rock Shovel you won't have to worry about output in dirt

O.K. - War Production Board- WEMCO Delivers On Time!

A Critical Metal Will be Produced Here - - - - WEMCO Equipment is in Place — *On Schedule* .

As a supplier of equipment for production of critical metals, Wemco accepts full responsibility for

DELIVERY on promised schedule,
PERFORMANCE with efficiency,
OPERATION with minimum shut-down.

The mill under construction, pictured in the above photograph, shows two Wemco Screw Classifiers in place . . . delivered on schedule.

Based on Wemco performance records, these classifiers will make clean, effective separation; will continue to render uninterrupted, trouble-free service for months and years.

The proof of these statements rests in Wemco's simplified engineering and rugged design. With the Wemco Screw Classifier, this means fewer moving parts, the maximum in sturdy construction and specially engineered critical parts, such as Wemco's outstanding, grit-proof submerged bearing.

Send for bulletins on any unit of the Wemco line, listed below. We promise efficient performance, low-cost, trouble-free operation and *deliveries on time.*

AGITATORS • FILTERS
DIAPHRAGM PUMPS
FEEDERS • CLASSIFIERS
CENTRIFUGAL PUMPS
HYDROSEPARATORS
• • • THICKENERS • • •

WEMCO
WESTERN MACHINERY COMPANY
760 FOLSOM STREET, SAN FRANCISCO, CALIFORNIA
LOS ANGELES • SACRAMENTO • SPOKANE • SALT LAKE CITY • PHOENIX • DENVER

A JOB FOR COMPRESSED AIR?

NO... USE THE COMPRESSED AIR TO DRIVE A COPPUS BLOWER.

You'll clear the face in minutes — and save compressed air.

MAXIMUM SPEED AND ECONOMY ON ANY MINE VENTILATING JOB

Whether it's a job of main ventilation for a small mine or secondary ventilation in a larger mine . . . 100 feet of pipe or 3000 feet . . . there's a Coppus Blower to do the job best.

Capacities run all the way up to 90,000 c. f. m. The Ventair, a centrifugal type, is for high pressures and long pipe lines; the Vano, a propeller type, is for medium pressures and shorter pipe lines. There is a choice of compressed air or electric motor drive.

For a given power consumption, you can expect *30% to 100%* more air than with general industrial types of blowers.

A COPPUS "BLUE RIBBON" PRODUCT

The blue band on the Coppus Blower means: 1, designed especially for mine ventilation; 2, manufactured to high Coppus standards well-known throughout industry; 3, carefully inspected to insure trouble-free service. For help in selecting the proper type and size, see Bulletins 121-3 and 122-3, obtainable by writing to Coppus Engineering Corp., 502 Park Avenue, Worcester, Massachusetts.

COPPUS

THE MINE VENTILATION PEOPLE

Representatives in principal mining centers. See THOMAS' REGISTER. In METAL & NON-METALLIC MINING CATALOGS: Coppus Air Filters for motors, generators, air compressors, internal combustion engines. Other Blue Ribbon Products: Steam Turbines, Coppus-Dennis Fanmix Gas Burners, Heat Killers, Blowers, Exhausters for Special Purposes.

MULTICLONES

Eliminate MANIFOLDING

Multiclone's exclusive vane design permits any number of tubes to be installed with one inlet header and one outlet header simplifying construction and eliminating the complications of manifolding. Less material is needed.

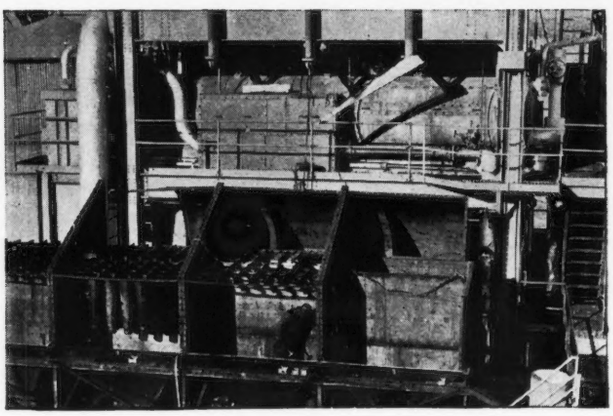
Less floor area and less headroom are required.

Because the gas travels over a smaller surface there is less surface subject to wear and because of the vane type of construction, should wear occur, it can affect only parts that are easily and readily replaceable without dismantling the entire unit.

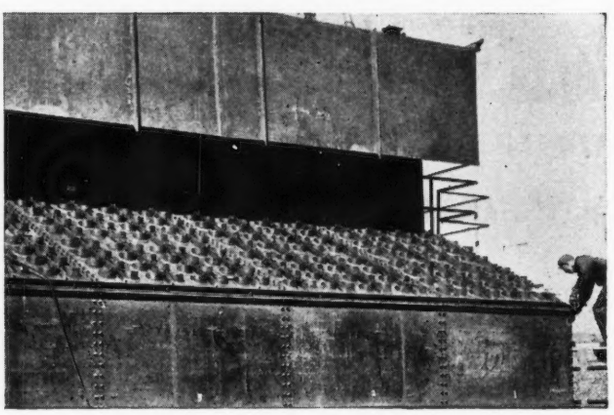
In the Multiclone, the simplified header construction together with the enclosure of the tubes by the hopper greatly reduces heat radiation. This facilitates temperature control and where condensation might occur reduces insulation requirements to a minimum.

The Multiclone design makes possible its installation in existing structures in what would otherwise be waste space and in places where manifolding would be impossible.

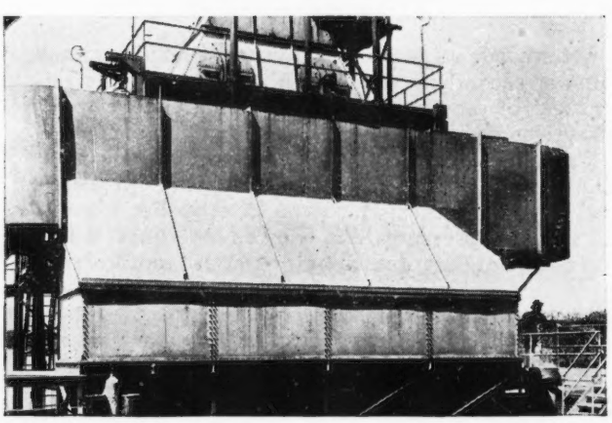
The single manhole through which all tubes can be reached simplifies inspection. Thus the elimination of manifolding simplifies installation, saves space, decreases wearing surface, reduces heat radiation and gives better temperature control.



Compact tube assembly.



Common header.



No manifolding. Multiclone discharges directly into flue.

ADDITIONAL MULTICLONE ADVANTAGES

1. High Efficiency.
2. No Fire Hazard.
3. Compact Tube Assembly.
4. Low Installation Cost.
5. Readily accessible for inspection.
6. No moving parts to wear out.
7. Rugged Construction.
8. Easily Insulated.
9. Low Power Consumption.
10. Easily Assembled.
11. Unit Dust Hopper.

WESTERN Precipitation CORPORATION

Engineers, Designers and Manufacturers of Equipment for Collection of Suspended Materials from Gases and Liquids

Main Offices: 1013 West Ninth Street, Los Angeles, Calif.; Chrysler Bldg., N.Y.C.; 140 S. Dearborn Street, Chicago; Hobart Bldg., San Francisco, Calif.

Precipitation Company of Canada, Ltd., Dominion Square Building, Montreal

SEND FOR THIS BULLETIN

Complete description and specifications of MULTICLONE Collectors. Your name on your company letterhead, please.

Another Strategic Mineral Operation:

OHIO COPPER COMPANY OF UTAH

USES PENTASOL AMYL XANTHATE TO HELP INCREASE RECOVERIES

In Utah's famous Bingham Canyon, Ohio Copper Company is helping the war effort by producing copper profitably from old tailings averaging only 0.42% Cu. PENTASOL AMYL XANTHATE is doing a special cost-saving job on this operation.

Copper minerals in this ore are chiefly chalcocite, with chalcopyrite and some pyrite. Copper values in the tailings are 31% acid soluble, and current operations involve leaching of this soluble copper and precipitating it on metallic iron, in the pulp, followed by flotation of the precipitated copper simultaneously with the sulphide copper, in an acid circuit.

Flotation feed is split among three 8-cell rougher machines. Each No. 1 cell produces final concentrate, and concentrate from the others receives one stage of re-treatment. In a typical month, flotation operations recovered 217,604 lb. of copper from 285,966 lb. of combined sulphide and precipitated copper in the flotation heads, or 74.15%.

PENTASOL AMYL XANTHATE'S primary function in this interesting operation is as collector of coarse pyrite, to reduce Ohio Copper's difficult problem of filtering the concentrate.

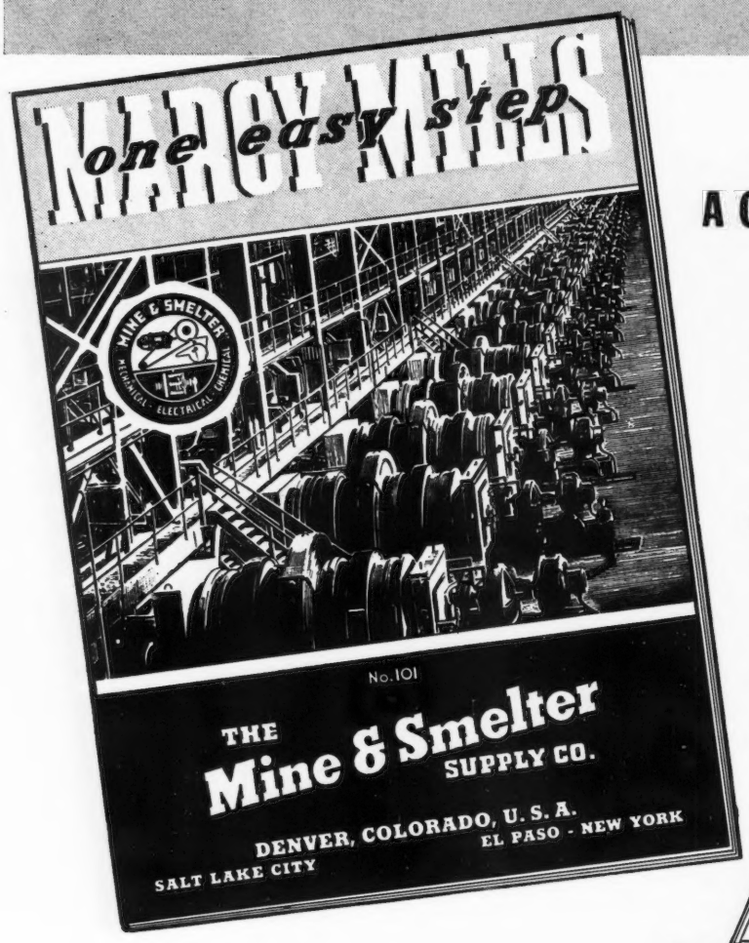
Have *you* a difficult flotation problem? No doubt you can profit from Pentasol Amyl Xanthate's extra collector power. Commercial Pentasol Amyl Xanthate is Bear Brand Z-6, manufactured from Sharples Amyl Alcohols (Mining Grade), by Great Western Division, The Dow Chemical Company. Let us have samples sent to you.

SHARPLES TRADE MARK CHEMICALS

SHARPLES CHEMICALS INC.

PHILADELPHIA CHICAGO NEW YORK

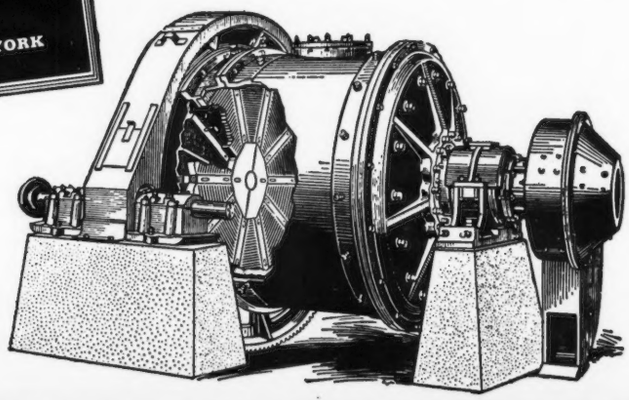
Let us send you this NEW MARCY CATALOG



A GUIDE TO EFFICIENT GRINDING

Not a big book as catalogs go—only 28 pages and cover, 8"x10½"—but a book which should be in the hands of every man responsibly concerned with grinding ore. This modest catalog contains much helpful information on grinding, capacities, ball charges, critical speed. Sent promptly on request.

★In spite of the tremendous increase in the production of all critical war metals the supply is still short. If grinding is a bottle neck in your plant, let us work with you and your consultants toward quick improvement in tonnage and metallurgy. Our world-experienced staff is at your service.



☆Other Products—Genuine Wilfley Tables; Density Controllers; Rock Bit Grinders; Amalgamators; Belt Feeders; Pinch Valves; LABORATORY EQUIPMENT; MINE & MILL SUPPLIES; COMPLETE MILLING PLANTS.

DENVER
SALT LAKE CITY
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The Mine & Smelter Supply Co.

CANADIAN
VICKERS, LTD.
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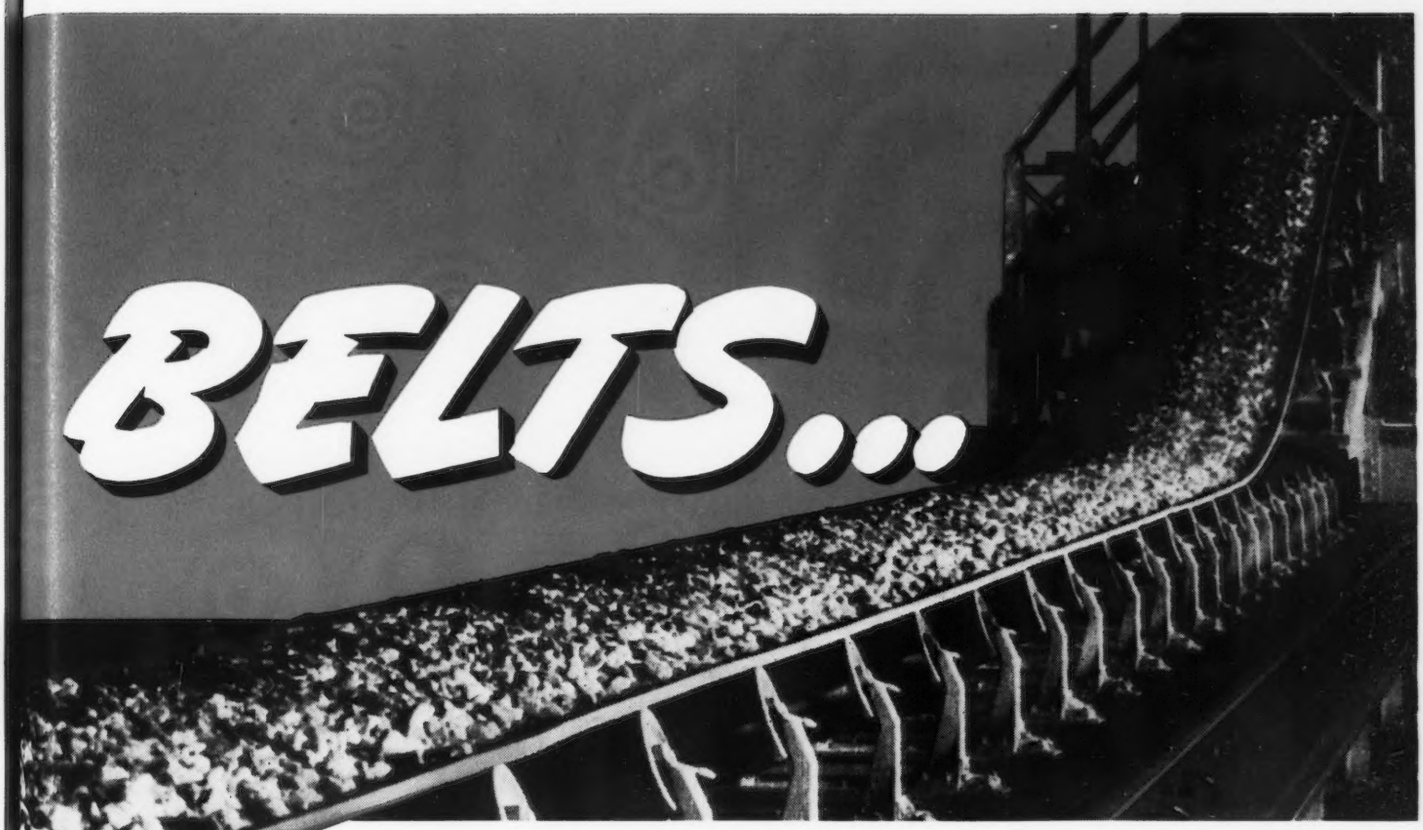


So you'll keep 'em rolling, knowing well that a little dip in your own production curve can make a difference right up where battle plans are laid.

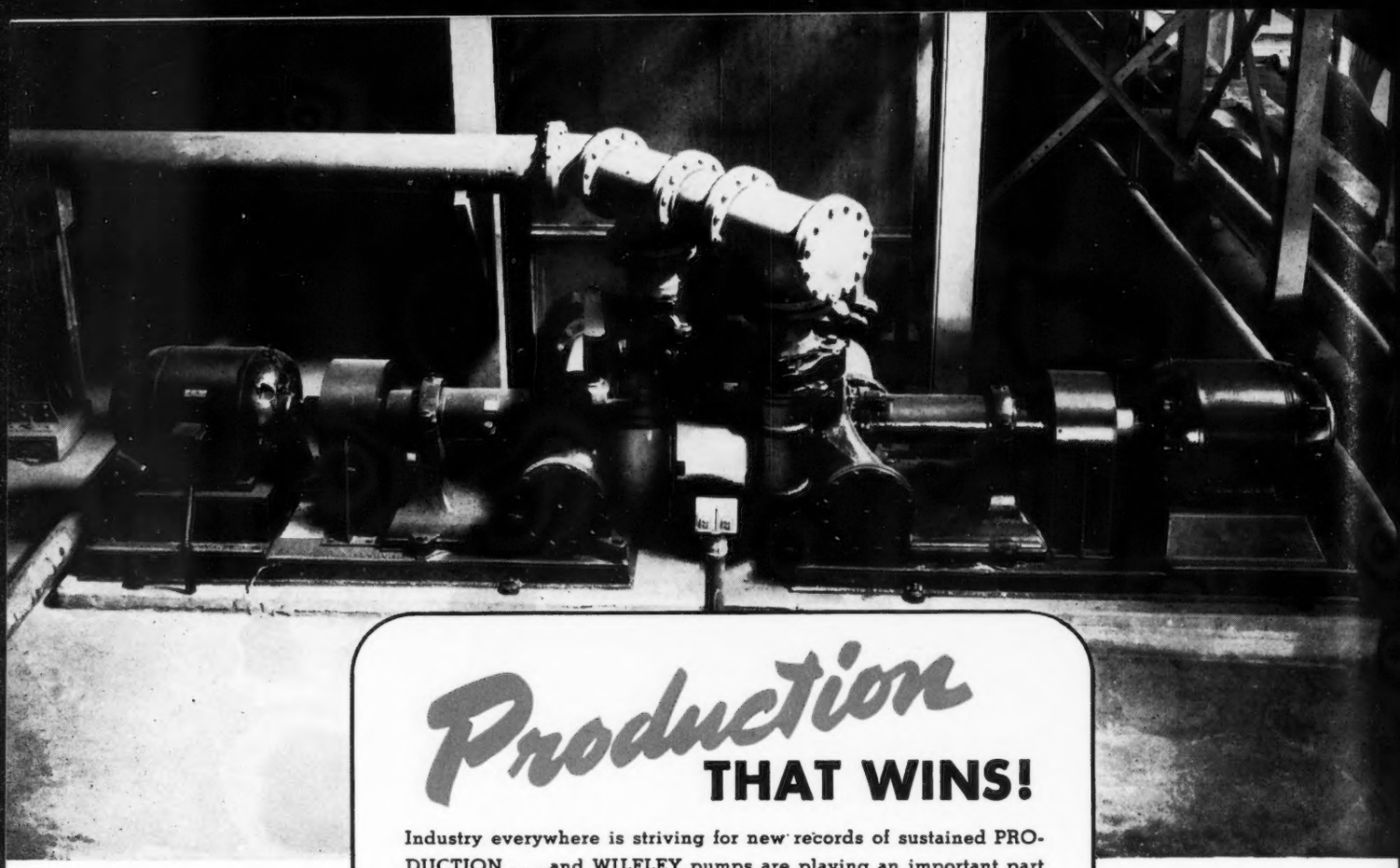
The importance of maintaining today's tonnage schedules calls for conveyor belts that do keep rolling. This makes good care and periodic inspections more essential than ever —and the HEWITT rubber man in your field can give you valuable help in this respect. Call on his services freely. He's backed by an organization with nearly a century of experience in producing belt and hose for the mining and other industries.

That's why you see so many HEWITT conveyor belts in service. HEWITT technicians are used to working in cooperation with mining men... studying on the job the requirements of moving materials underground and in pits, in separation and treating plants. This knowledge of conditions such as you meet is reflected in tough rubber covers specially developed to resist cutting and abrasion, to prevent stripping and to keep out mildew. It's reflected in the strong duck plies firmly bonded to their protective cover with premium quality friction compounds.

In synthetic rubbers, too, mining men are finding HEWITT ready: from the beginning more than twelve years ago, HEWITT has pioneered in utilizing the superior properties of synthetic rubber for industrial needs.

ALMOST A CENTURY OF EXPERIENCE AS *Specialists* IN INDUSTRIAL HOSE CONVEYOR AND TRANSMISSION BELTS • PACKING

CORPORATION
BUFFALO, NEW YORK



Production THAT WINS!

Industry everywhere is striving for new records of sustained PRODUCTION . . . and WILFLEY pumps are playing an important part in delivering a kind of performance that breaks records. That's because WILFLEY is the pump that delivers 'round the clock performance *without attention* . . . day in and day out for months on end. Exclusive features of design and construction account for WILFLEY'S outstanding performance and dependability . . . make it the recognized leader in the pumping field. Heavy pumping parts of rubber, alloy iron, alloy steel . . . the exact material or combination that delivers best results on your particular job. Individual engineering service. If you want a pump that handles slimes, sands and slurries at lower cost, WILFLEY is the pump to buy. Write for complete details.

A. R. WILFLEY & SONS, Inc., Denver, Colorado, U. S. A.

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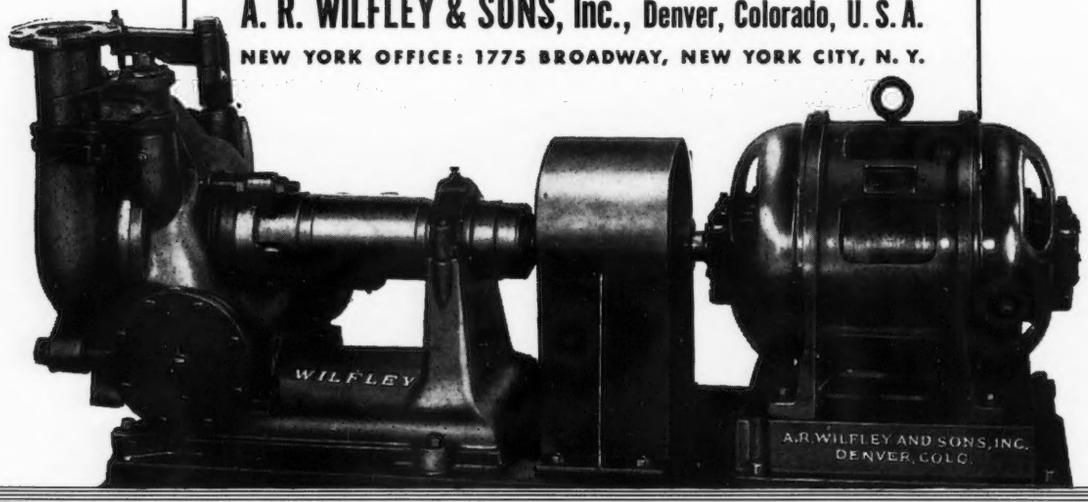
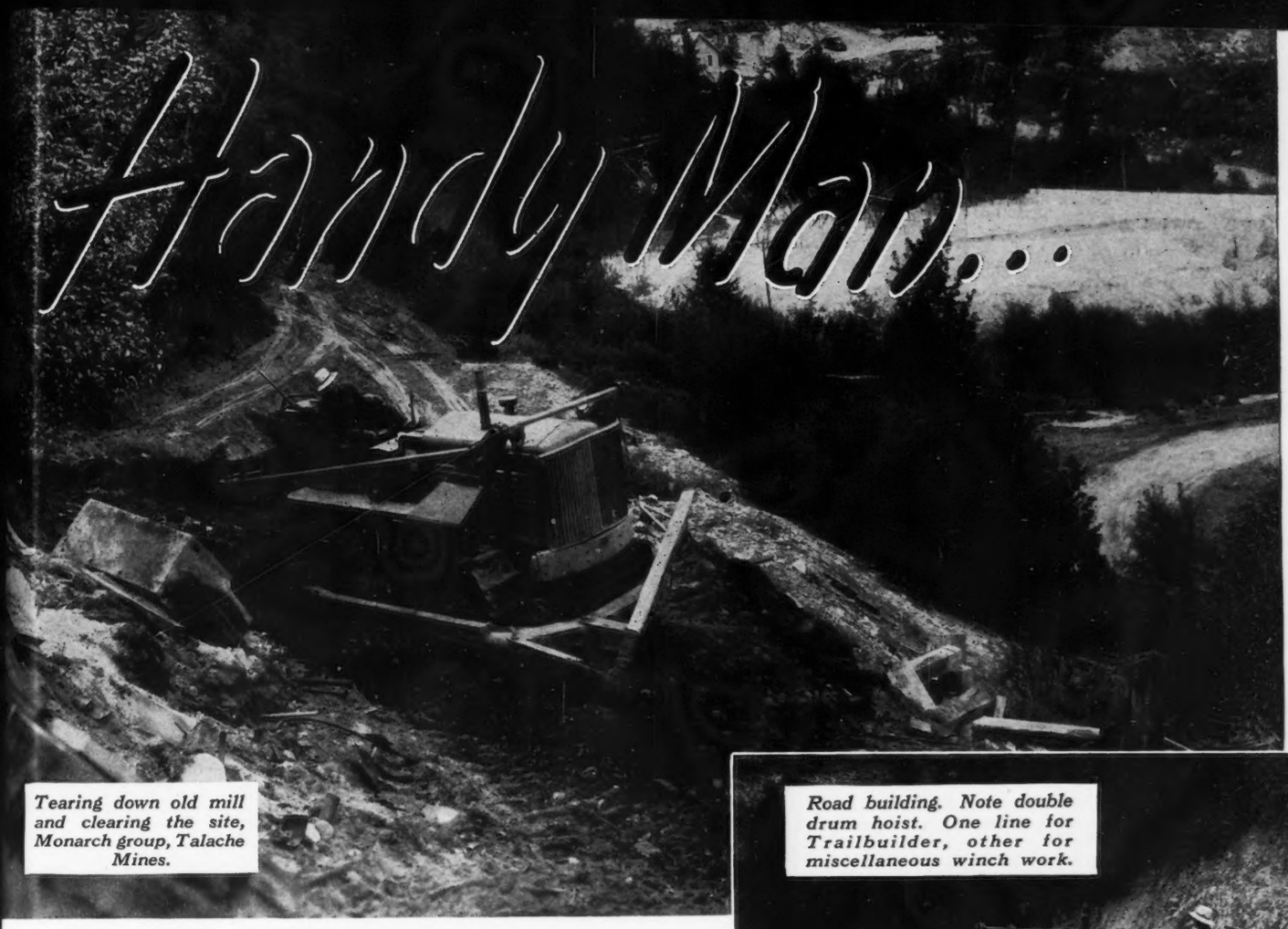


WILFLEY

centrifugal PUMPS

Handy Man . . .



Tearing down old mill and clearing the site, Monarch group, Talache Mines.

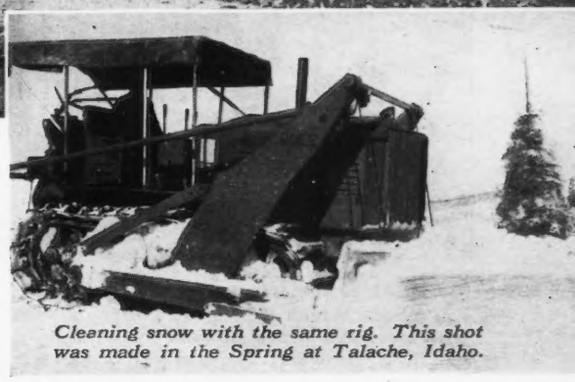
Road building. Note double drum hoist. One line for Trailbuilder, other for miscellaneous winch work.

. . . . AT TALACHE MINES

THIS Buckeye Unitilt Trailbuilder and Model MD Power Control Unit on a Cletrac FDL really earn their keep at the Talache Mines' properties in Idaho. Summer and winter, they're on the job keeping things rolling—building roads, cleaning mill sites, filling in old stopes, snaking out timber, clearing snow and doing a dozen and one other jobs that a tractor and fast, responsive cable controlled equipment can do best.

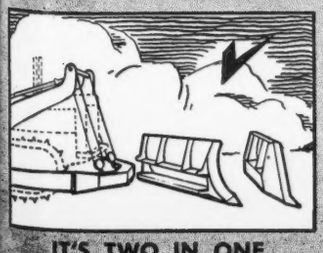
Buckeye Bulldozers, Trailbuilders and Hoists are built for all makes and models of tractors. Buckeye Hoists are built in medium heavy duty and heavy duty models, single or double drum, for operating any cable tractor equipment and for a tremendous variety of miscellaneous winch jobs. These units have exclusive features that mean longer life, lower costs and faster work. For full details write to Buckeye for data and location of nearest dealer.

BUCKEYE TRACTION DITCHER CO., Findlay, Ohio

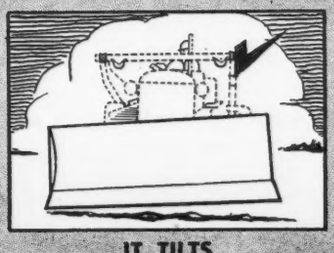


Cleaning snow with the same rig. This shot was made in the Spring at Talache, Idaho.

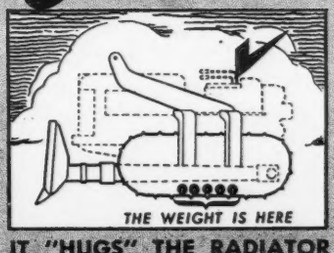
Built by Buckeye



IT'S TWO IN ONE

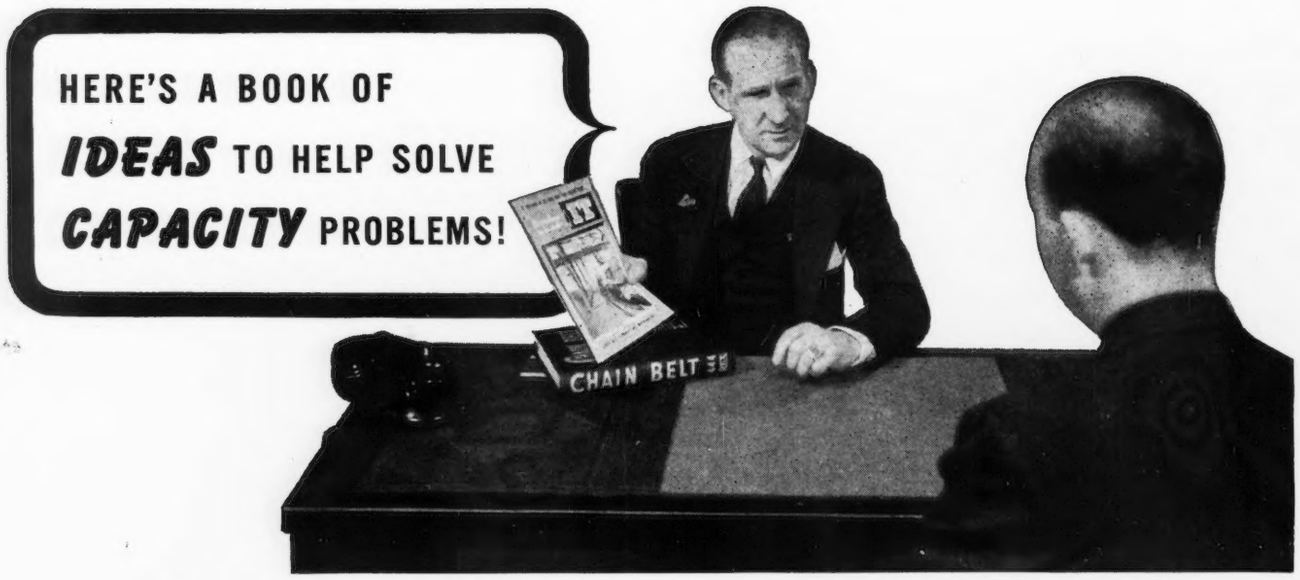


IT TILTS

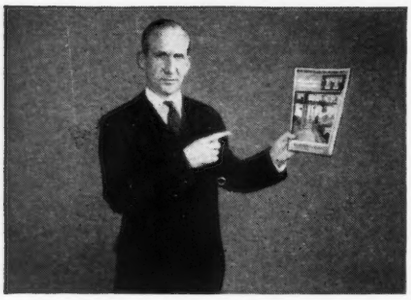


IT "HUGS" THE RADIATOR

IT ROLLS THE DIRT



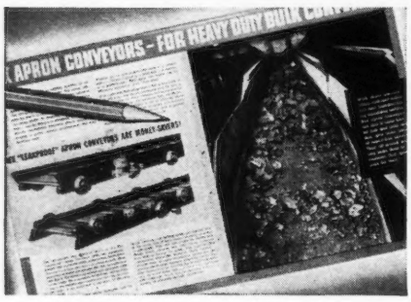
. . . LET ME SHOW YOU WHAT IT CONTAINS . . .



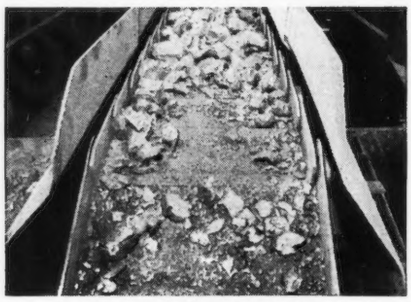
① **IT'S BUILT AROUND** a single idea; how Rex conveyors can help increase your capacity with minimum cost to you —minimum disturbance to your production set-up. That's a sound basis, isn't it?

② **"YOU BET IT IS"**, this engineer told me, "and if it lives up to its objectives, it certainly will give me some handy hints. I see that on the first page you get started in your story immediately."

③ **YOU BET WE DO.** We tell immediately how the three classes of Rex conveyors —belt conveyors, apron conveyors, and all types of bucket elevators—can fit into the needs of any plant, new or old.



④ **THERE IS** the information that tells you exactly which Rex apron conveyor will meet the needs of your material handling problems . . . ways in which you can speed up production at small cost and with minimum delay for installation.



⑤ **IT GOES RIGHT DOWN** the line. First of all, it shows you how other plants have used Rex conveyors, elevators, or apron conveyors. And you know that that's one of the best sources of information any plant operator has.

⑥ **ANYONE RESPONSIBLE** for production these days should have the very latest information on materials handling equipment designed by Rex. This free book will be well worth the time you take to send for it.

Rex conveyors are seeing extensive service these days, as they have for years past. They no doubt can help you out of many a hole when it comes to increasing capacity. See the Rex man at your convenience. Naturally, orders bearing highest priority distinction take precedence. Address 1679 *W. Bruce Street, Milwaukee, Wisconsin.*

REX CONVEYORS

CHAIN BELT COMPANY OF MILWAUKEE

Baldwin-Duckworth Chain Belt Division, Springfield, Massachusetts • Worcester, Massachusetts
Rex Conveying and Engineering Products Division, Milwaukee, Wisconsin

REX CHAIN BELT COMPANY

FOR MORE TONNAGE EVERY SHIFT

TO SPEED PRODUCTION
of COPPER, MOLYBDENUM, TUNGSTEN, ZINC, MAGNESIUM & IRON

Big operators never buy pigs in pokes. Their decisions are based on positive, factual information. Big plants can well afford to test and compare before placing large orders. Smaller plants cannot afford exhaustive tests, but they CAN safely follow the judgment of the leaders in the industry.

Check up on all *major* milling plants recently built or now under construction. You will find that, like Abou Ben Adhem, AKINS' name "leads all the rest."

The dominant preference for AKINS Classifiers in recent years certainly cannot be accidental . . . and that fact carries important inferences for management and engineers.

AKINS Classifiers can help YOU get more tonnage every 24 hours.

We also manufacture:
SKINNER MULTIPLE HEARTH ROASTERS; LOWDEN DRYERS; BALL, ROD & TUBE MILLS; SMELTING EQUIPMENT; CRUSHERS & ROLLS; DIAPHRAGM PUMPS.

COLORADO IRON WORKS CO.

MAIN OFFICE DENVER, COLORADO, U.S.A.

CANADIAN LOCOMOTIVE CO., LTD., KINGSTON, ONT., CAN.
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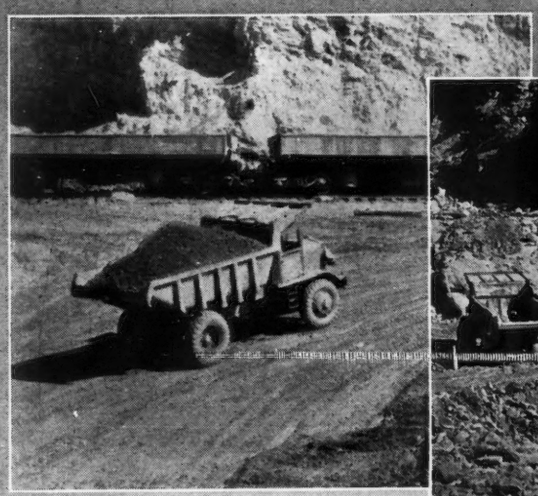
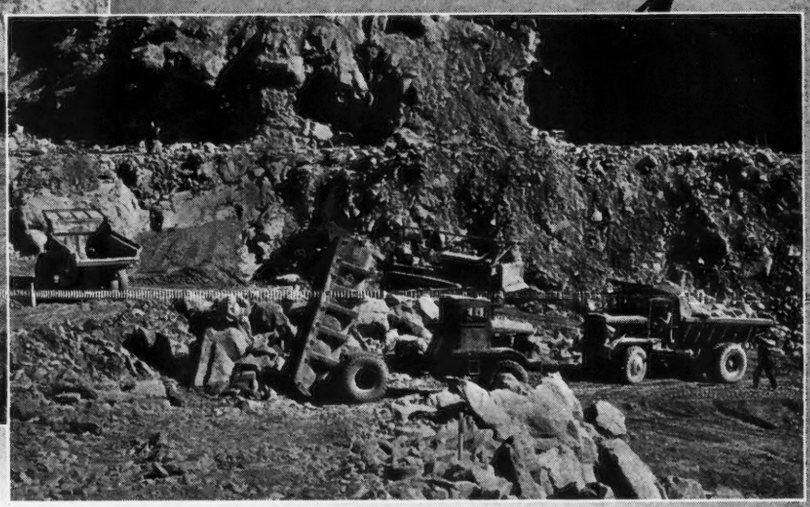
HEAD, WRIGHTSON & CO., LTD., STOCKTON ON TEES, ENGLAND
HEAD, WRIGHTSON & CO., (SO. AFRICA) LTD. JOHANNESBURG
THE CLYDE ENGINEERING CO., LTD., GRANVILLE, N.S.W.

"KNOW HOW" *Isn't Enough!*





● Simply knowing how to operate Rear-Dump or Bottom-Dump EUCLIDS doesn't mean that the full life and efficiency of the units will be obtained unless the "know how" is carefully utilized. For example, low gears should always be used in starting, but it is a rather common practice to start in one of the higher gears simply to save a little effort. Sure, Euclids will start in the higher gears, even with heavy loads, but this causes excessive wear on the transmission, clutch and other parts, resulting in higher maintenance costs and more time off the job.

Another place where "know how" must be applied is in the use of the instruments on the dash. Those instruments provide an "x-ray" of the engine at a glance — they indicate that it is operating properly or warn that it needs attention. Unless engine operation, fuel and air pressures, etc., are carefully checked every shift before the unit goes on the job, and frequently during operation, damage to parts, inefficient performance and costly delays may occur. By using "know how" to keep the Euclids you own or operate in good condition so that they can do the jobs that bring victory closer, you'll be helping to build a better America of tomorrow.

The EUCLID ROAD MACHINERY Co., CLEVELAND, OHIO

EUCLID SELF-POWERED HAULING EQUIPMENT For EARTH . . ROCK . . COAL . . ORE

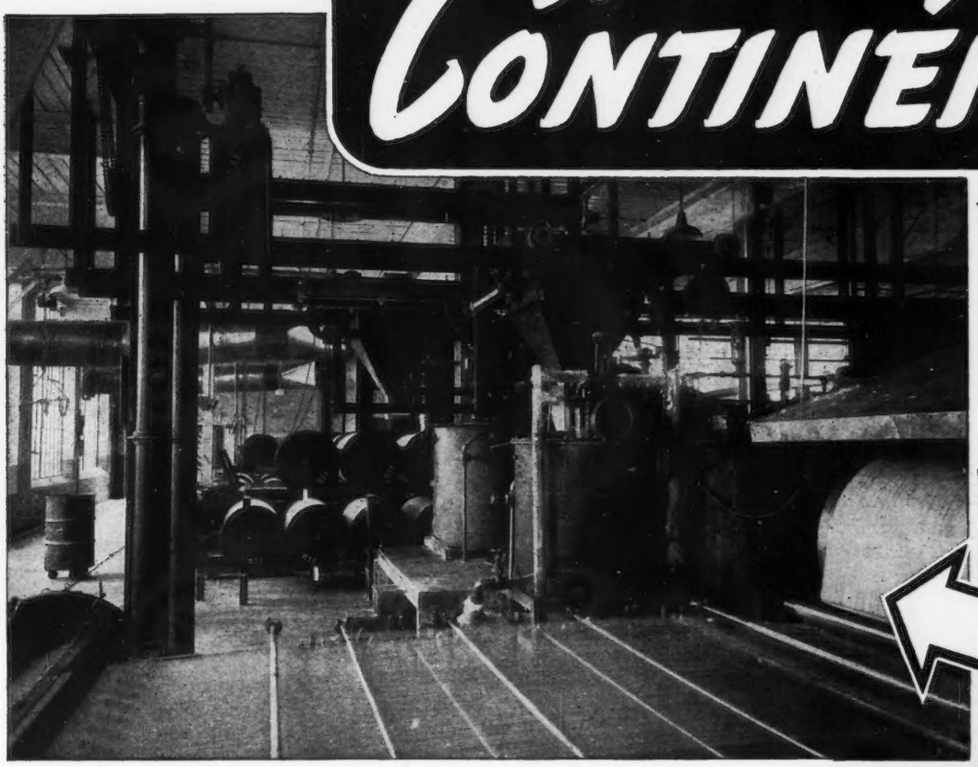
CRAWLER WAGONS • ROTARY SCRAPERS • TAMPING ROLLERS

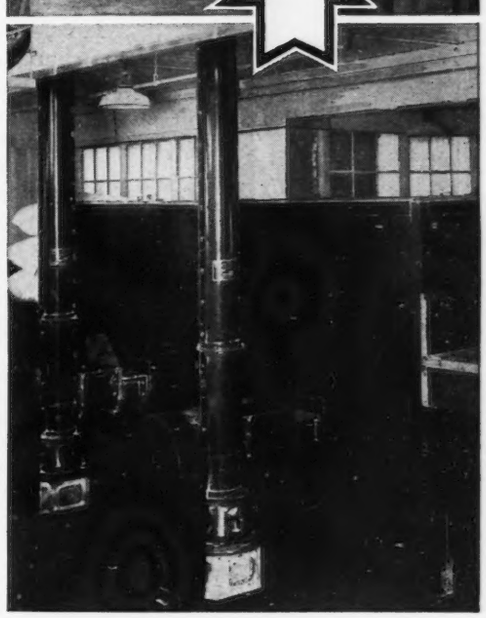
EUCLID THE PIONEER

★★★★★★★★★★

Another Job by.. CONTINENTAL

★★★★★★★★





ILLUSTRATED here is another job by Continental—another example of Continental's engineering ingenuity. This is but one of many installations designed and built by Continental for mechanically handling materials of almost every known characteristic. In the Mines, the Steel Mills, Chemical Plants, Textile Mills, Aluminum and Magnesium Plants and many other vital industries, Continental Materials Handling equipment is helping to boost production in our fight for Victory.

Solving your Materials Handling difficulties is our business. Our experienced engineering staff and flexible manufacturing facilities are always ready to tackle your problem and should you require a complete installation, a belt or chain drive, or simply a replacement bearing, it will pay you to *Specify Continental*, Engineers and Manufacturers of Materials Handling and Power Transmission Equipment. For further details write Department "E."

INDUSTRIAL DIVISION

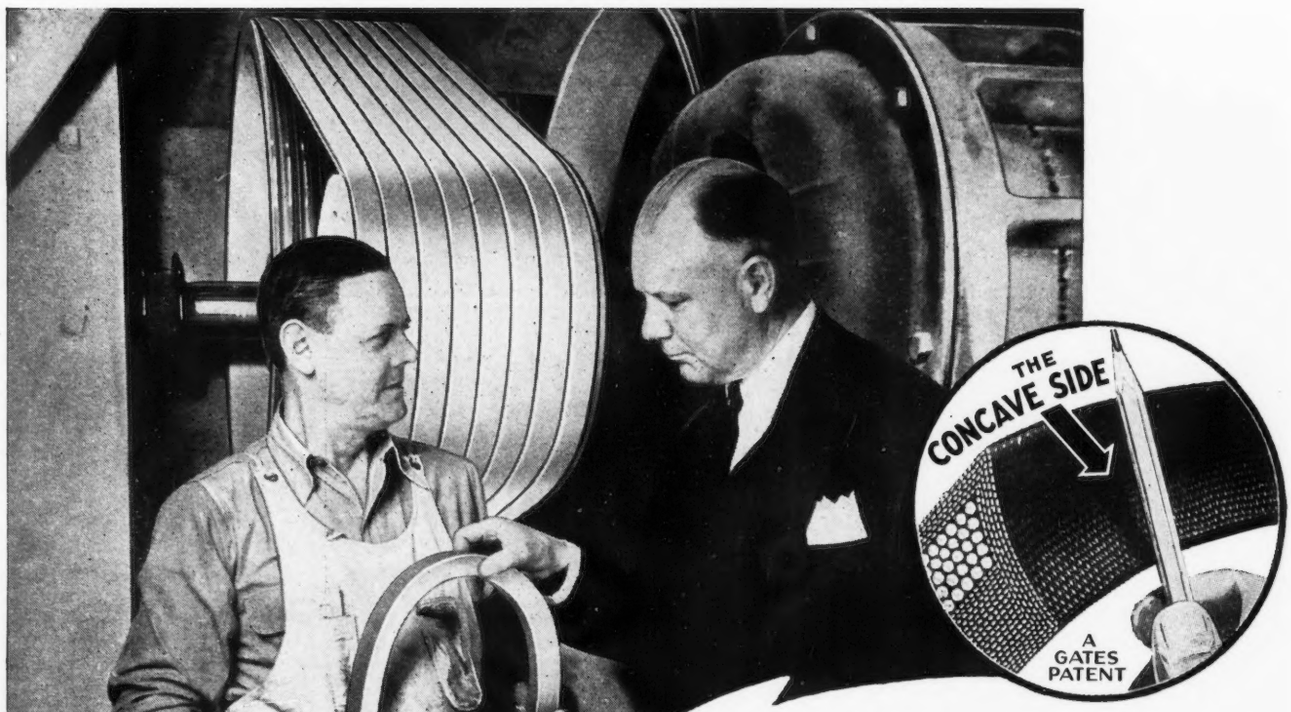
Continental

GIN COMPANY

BIRMINGHAM, ALABAMA

ATLANTA, GA. DALLAS, TEX. MEMPHIS, TENN.

★★★★★★★★★★★★★★★★★★★★



This Simple Test Shows Why the CONCAVE SIDE Cuts Belt Costs!

What Happens When a V-Belt Bends

FIG. 1

FIG. 2

If you care about belt costs, pick up any V-belt you have handy and make this simple test:—

Bend the V-belt while you grip its sides and you will feel how the belt changes shape. The top, under tension, narrows. The bottom widens. The sides of the belt bulge out. Clearly, if its sides were straight to begin with, the bent belt is forced into a shape that does not fit the sheave groove—as shown in figure 1, on the left.

Now, bend a V-belt built with the patented Concave side. You get the same shape change, but now the new shape exactly fits the sheave groove—as shown in figure 2. There is no side-bulge. Results? (1) Uniform side-wall wear—longer life! (2) The belt gets a full side-width grip on the pulley—carries heavier loads without slippage. This cuts belt costs and saves power.

Only belts built by Gates are built with the Concave side, which is a Gates patent.

THE GATES RUBBER COMPANY

Engineering Offices and Stocks in All Large Industrial Centers

GATES VULCO ROPE DRIVES

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New York City 215-219 Fourth Avenue
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Available without Priority

FOR MAINTENANCE AND REPAIRS

Rebuild worn parts — conserve precious steels, save time, save money — and aid the war effort by welding.

For hard surfacing, resistance to wear, abrasion, and impact, P&H Alloy Electrodes may be obtained without priority. The only restriction is that the electrodes be used for maintenance and repair work.

P&H is ready to help you: First, in making available a full line of alloy electrodes for hard surfacing, welding of stainless steels, 4-6% chrome steels, etc. Second, by answering your specific questions as to the proper choice and applications of electrodes to solve your maintenance and repair problems.

See your nearest P&H welding representative or write us for the list of P&H Alloy Electrodes along with recommended modern welding procedures.

P&H-HANSEN WELDERS

Square frame design permits stacking of machines for single or multiple use with instant parallel hook-up. In either case single control provides any desired welding current with automatic arc response on all classes of work. Simpler, more accurate, easier to learn. Write for Bulletin W-28 for complete information.

General Offices: 4454 West National Avenue, Milwaukee, Wisconsin

HARNISCHFEGER
CORPORATION
WELDING ELECTRODES • MOTORS • HOISTS P&H ELECTRIC CRANES • ARC WELDERS • EXCAVATORS

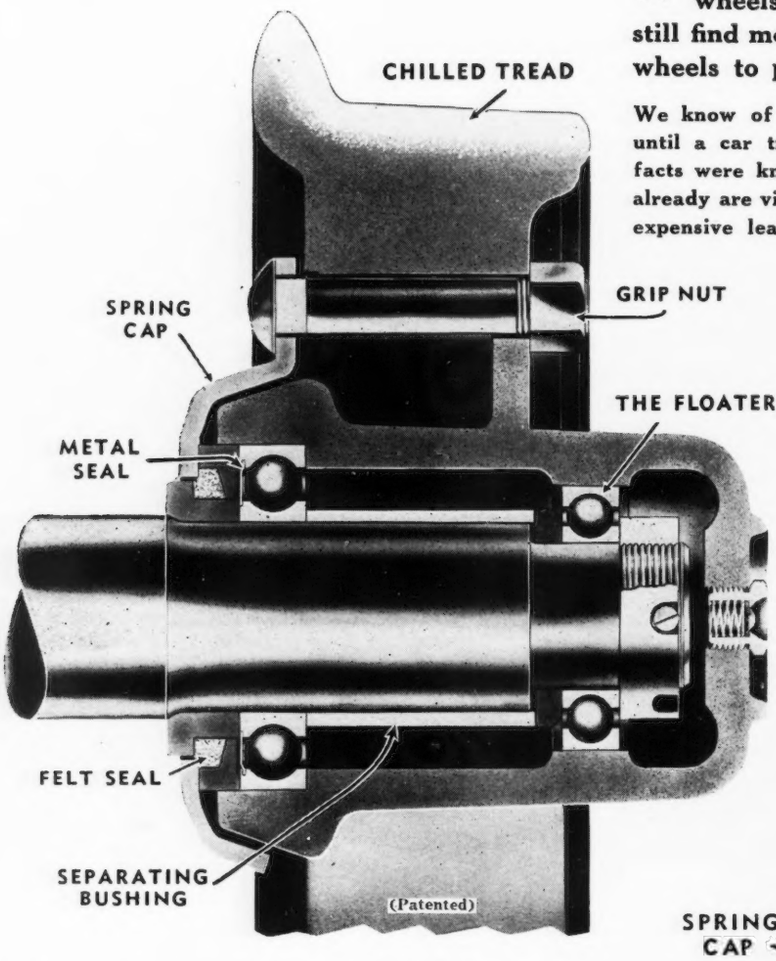
Canadian Distribution: The Canadian Fairbanks-Morse Co., Ltd.

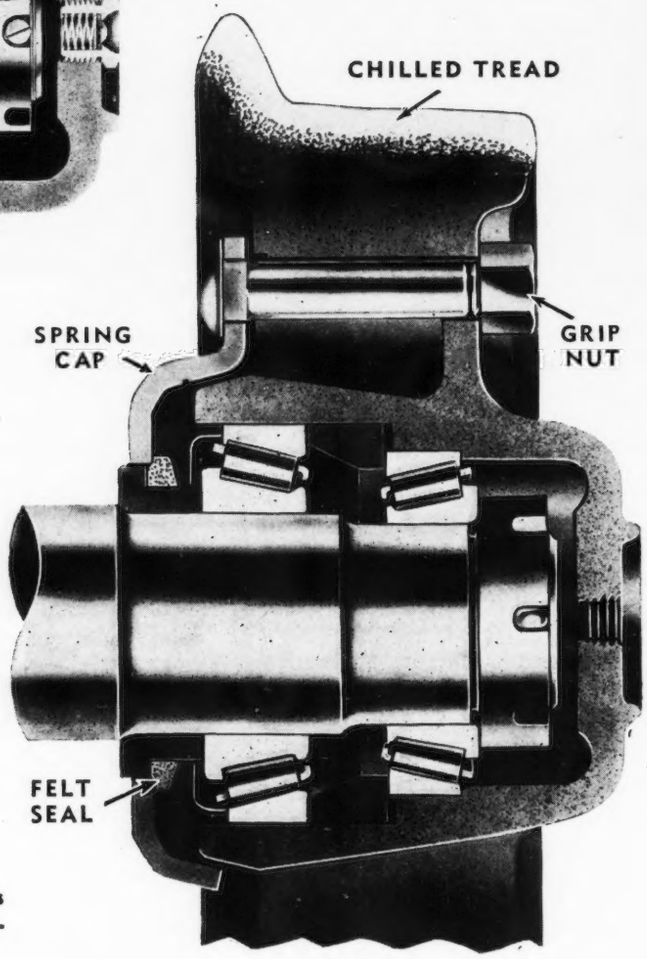
We've Been At It 100,000 Hours!

★ **For over 40 years, we've been making car wheels of every conceivable type. Yet, we still find men who overlook the vital importance of wheels to profitable operation in mining.**

We know of operators who never give a thought to wheels until a car truck breaks down. When, if the performance facts were known, they would realize that all of their trucks already are virtually broken down. Such cases mean extremely expensive leaks, resulting in lost production and high maintenance costs.

Constant work in improved design and construction of S-D wheels has provided mining with the most perfect and most economical precision wheels the industry has ever known. That's why wide-awake operators have thousands of S-D Precision bearing wheels in use today. Value in money saved has made the S-D "Floater" the industry's best known wheel.





Two Remarkable Wheels!

The sectional view above shows our famous S-D "Floater" Ball Bearing Wheel—the easiest running mine car wheel we know of. Independent engineers' tests prove that haulage capacity of locomotives can be increased up to 50 per cent when cars are equipped with "Floaters", as compared with wheels equipped with other types of precision bearings.

Shown at right is our latest prize—the S-D Timken Bearing equipped wheel. Both of these fine wheels are quickly demountable, and when demounted, bearings remain in perfect adjustment on axle. Solid front hub and double back seal mean big savings in grease and labor of greasing. Write us now for more complete details.

One of the largest producers of replacement wheels of all types. Send us your repair orders for production under our patented annealing process.

Sanford-Day Iron Works, KNOXVILLE, TENNESSEE

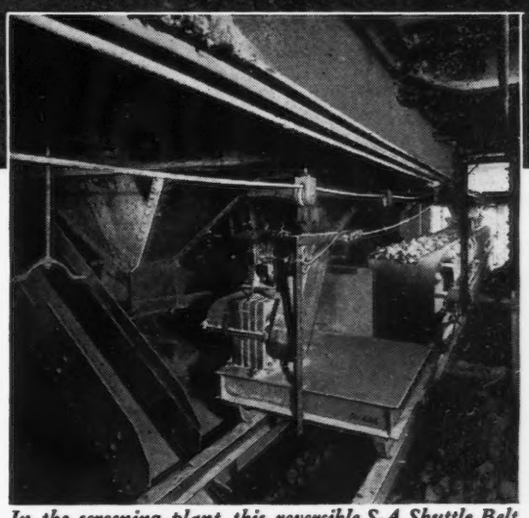
This War BOOM Stores Flux Stone

● Here is a Stephens-Adamson Belt Conveyor installation that stores 30,000 tons of flux stone . . . ready for screening or shipment on an instant's notice . . . no delays, simply draw stone from any part of the pile and convey it to the plant or waiting cars.

The storage and reclaiming systems are designed around the boom conveyor, which swings through an arc of 90° to store in a huge semi-circular pile. The boom can also be raised and lowered through 40° to permit piling high for great storage volume or lowered for short drop to prevent breakage.

Stone is reclaimed to plant or for shipment by belt conveyors in tunnels beneath pile. The plant is also equipped with S-A Feeders, Conveyors and Screens.

STEPHENS-ADAMSON MFG. CO.
4 Ridgeway Avenue, Aurora, Illinois
Los Angeles, Cal. **Belleville, Ontario**

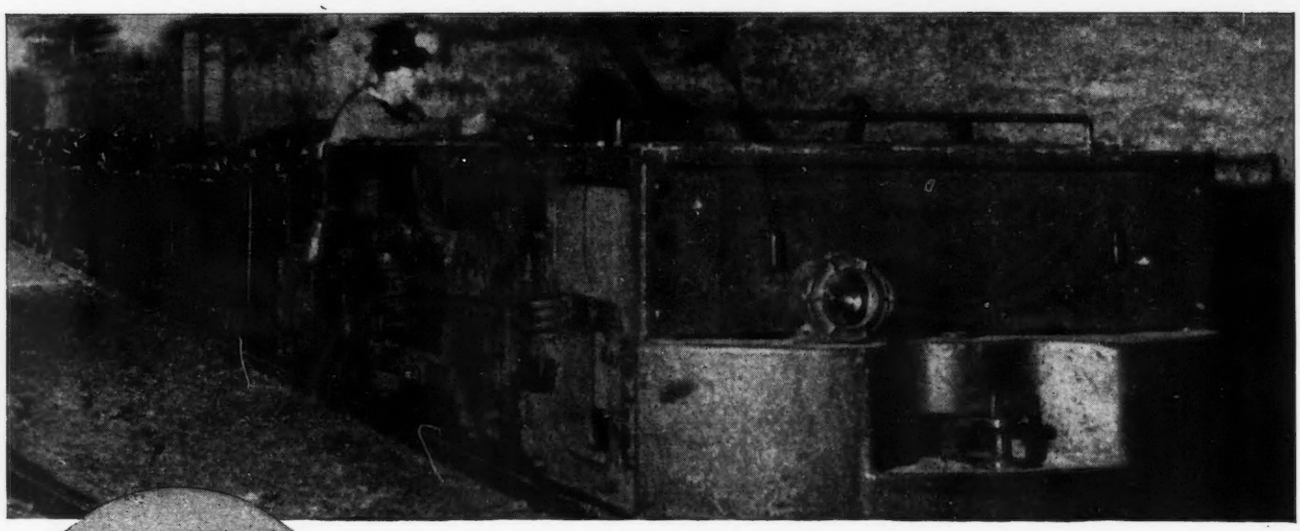


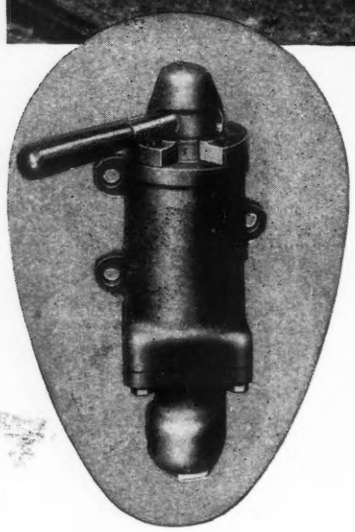
In the screening plant, this reversible S-A Shuttle Belt Conveyor can be made to discharge to any part of a storage bin of twice the length of Belt Conveyor.

STEPHENS-ADAMSON MFG. CO.

Chains and Sprockets · Belt Conveyors · Bucket Elevators · Crushers
Bin Gates · Pan Conveyors · SealMaster · Feeders · Screens
Speed Reducers · Redler Conveyors · Ball Bearings · Skip-Hoists · Winches and Car Pullers

The WESTINGHOUSE *Hydraulic* BRAKE





ITS *Distinctive* OPERATING VALVE ("Self-Lapping" Type) *Provides...*

Simple, effortless manipulation.

Instant response to operator's intent.

Pressure build-up proportional to degree of handle movement.

Prompt, precise graduation on or off.

Desired intensity easily and quickly attained.

Produces the following results: Loading operations are faster ★ Serviceability of existing equipment enhanced ★ More loaded cars kept rolling, more trips made ★ Faster haulage on descending grades, safely ★ Longer life for mechanical elements and electrical apparatus ★ Tandem operation facilitated ★ Tonnage production increased for wartime requirements.

The Westinghouse Hydraulic Brake is a simple, compact system, easily installed on any small locomotive, new or old.

WESTINGHOUSE AIR BRAKE COMPANY

INDUSTRIAL DIVISION » » » PITTSBURGH, PENNA.

Midvale's pioneer work on Naval armor plate produced the nickel chrome steel alloys which made automobiles possible

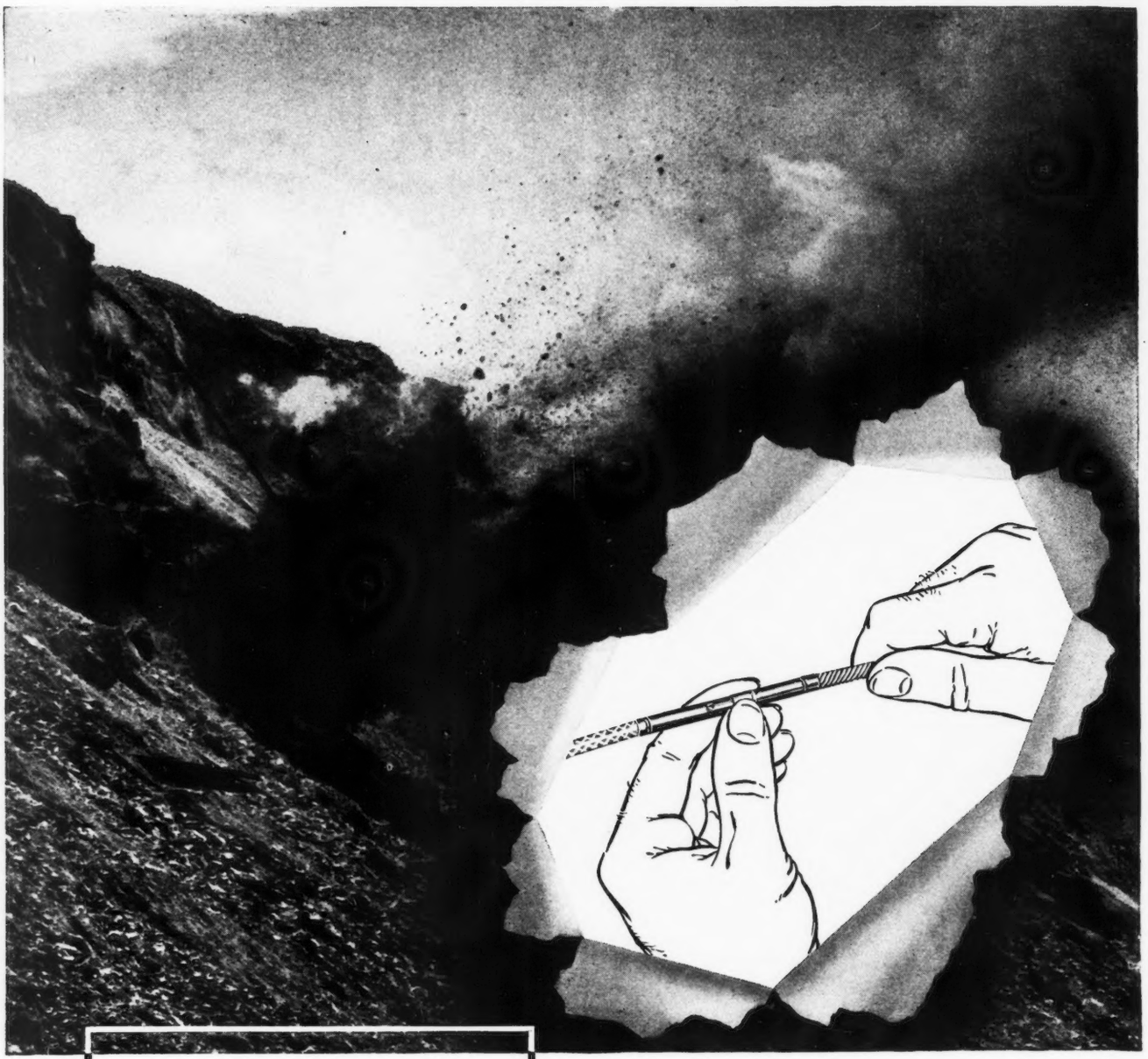
These alloys, developed by Midvale for war, made possible the tremendous peacetime growth not only of the automobile industry, but, through it, of our whole national mode of living and thinking. For, if automobiles had been forced to rely on the carbon steels that built the railroads, the size and weight of all parts to secure required strength would have been prohibitive. Similarly, the work being done today at Midvale is promise of greater growth, undreamed-of possibilities—tomorrow.

1867 75TH ANNIVERSARY 1942

THE MIDVALE COMPANY • NICETOWN • PHILADELPHIA, PA.

OFFICES: New York • Chicago • Pittsburgh • Washington • Cleveland • San Francisco

MIDVALE



Here's the only cap on the job!

When Primacord is the detonating agent, a single cap is the *only one* needed to set off an entire series of holes! It is attached after everything is ready—connections checked, equipment moved and men in a safe place.

Insensitive to fire, friction and ordinary shock, Primacord must be *deliberately* detonated by fuse and cap or electric blasting cap. Once its tremendous explosive power has been released, it flashes through the entire hookup at 3.85 miles a second! . . . detonating cartridges in all holes almost instantaneously.

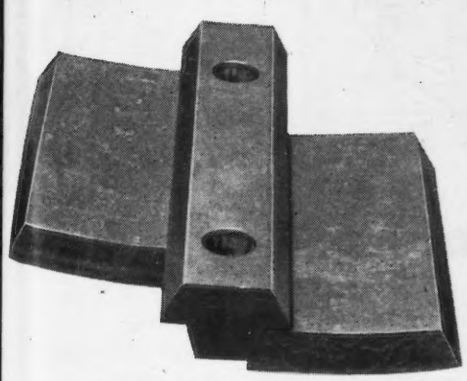
Primacord offers many advantages in safety and savings. Consider it for your blasting work, on large jobs or small.

THE ENSIGN-BICKFORD COMPANY
SIMSBURY, CONNECTICUT
Manufacturers of Safety Fuse since 1836

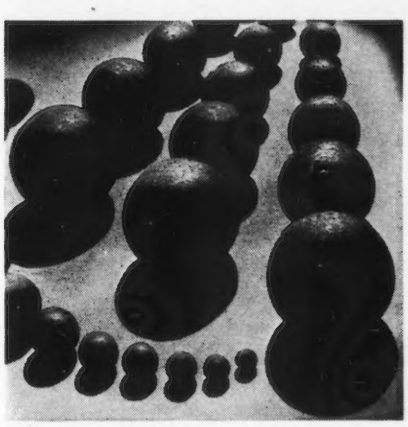
PRIMACORD-BICKFORD DETONATING FUSE

What the "LONG GRIND" will prove about rolled mill lining

Rolled Steel Plate Lining designed for preliminary clinker grinding in a 10'6" diameter x 12' ball mill, loaded with 50 tons of 4" balls.



U·S·S LORAIN ROLLED STEEL PLATE LINING. Notice how the lifting bar not only wedges between the liner plates, but also clamps over them. This eliminates rocking. Lining is adaptable to any mill for any grinding conditions, wet or dry. It is being used successfully for grinding lead ores in flint rock, coke breeze, mixtures of ores for chemicals, magnesite, cement rock and clinker.



U·S·S LORAIN GRINDING BALLS are forged from new steel and accurately heat-treated to produce balls that are hard enough to withstand abrasion and yet resilient enough at the core to prevent breakage. Standard sizes are available from ½" to 5" diameter.

Wartime performance of grinding equipment will determine tomorrow's preference. How installed U·S·S Lorain Linings are meeting this test.

WAR has put grinding mills on the spot. Few new mills can be installed. Few replacements for worn parts can be made. Yet peak production is expected. This critical situation calls for extra performance by equipment already installed. As a basis for future selection, we urge you to keep an eye on the wartime performance of U·S·S Lorain Lining, as compared with cast lining. Watch for the operating results outlined below.

HOW LORAIN FEATURES MEET EXACTING WAR NEEDS

BY INCREASING TONNAGE OUTPUT — Reduced thickness of the rolled steel plate increases the usable mill diameter, resulting in either increased tonnage of grind or greater fineness of the finished product.

BY SAVING METAL — The high strength of rolled steel plate makes possible the use of thinner lining plates than possible when using castings. Lining plates and lifting bars have less individual weight than cast lining plates.

BY REDUCING REPLACEMENTS — More metal is saved, because rolled steel linings can be worn well beyond the point where cast plate would fail. And because Lorain lifting bars and plates are reversible, it's possible to get maximum service from each.

BY SIMPLIFYING MAINTENANCE—Individual Lorain plates and lifting bars, being symmetrical, are always interchangeable and reversible. Thus, undue wear in any portion of the mill can be cared for without the necessity of replacing either the entire lining or the individual plates, as in the case of cast linings.

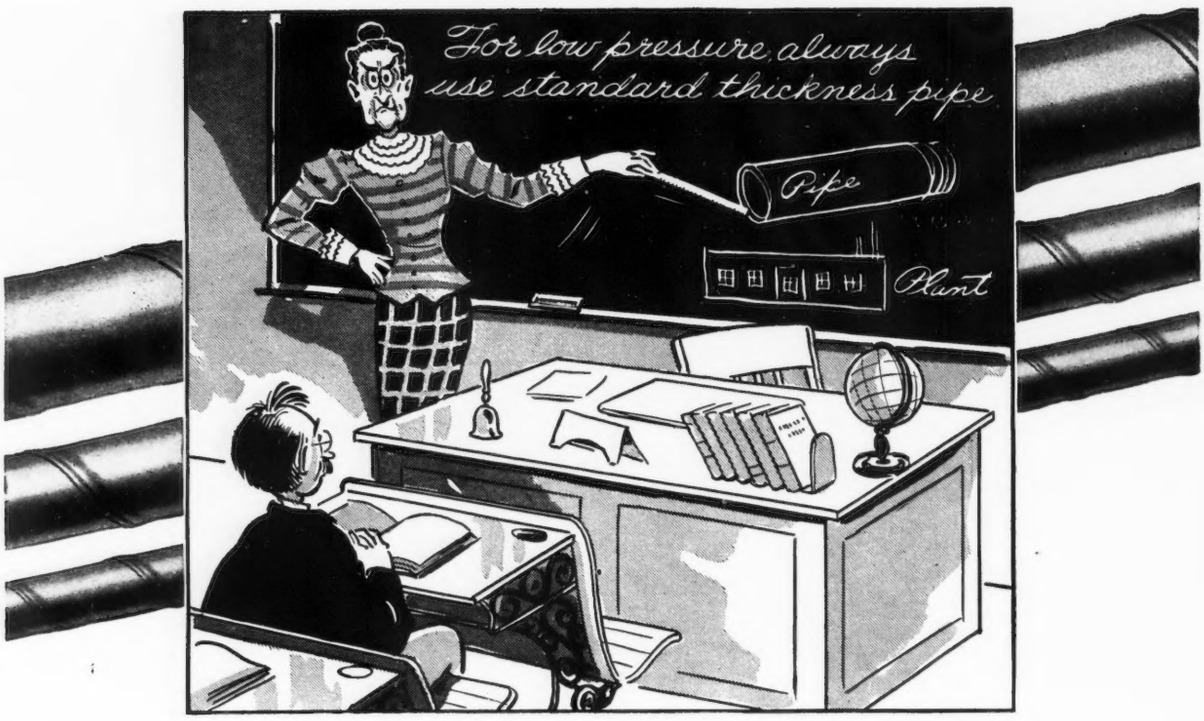
BY SAVING TIME—The rolled steel plate lining is easily and quickly installed in a mill, the actual saving in man-hours being dependent on the size of the mill. In large mills as much as three days of four men's time have been saved.

Write for more information on these superior grinding products. Their present availability, of course, is subject to close priority limitation.

LORAIN ROLLED STEEL PLATE LINING
LORAIN GRINDING BALLS

CARNEGIE-ILLINOIS STEEL CORPORATION
Lorain Division · Johnstown, Pa.
Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Export Company, New York

UNITED STATES STEEL



Meet Miss Application of the old school—

SHE'S been the "school marm" of a certain well-intending school of thought for many a year . . . and you're correct in suspecting that her name is usually spelled MISAPPLICATION!

When materials were plentiful, few men questioned her doctrines. But now there is scarcity, and industry, on the alert to check all forms of waste, has discovered that *Mis-application* can be one of the worst offenders.

There are endless examples of this, but a particularly good one is found in industry's time honored practices in selecting pipe. The piping requirement may involve simply low or very moderate pressure water, air or exhaust steam, yet our old friend "Miss Application" says: "It's low pressure so just order standard thickness pipe the way I've always told you."

The fact is, however, that light but strong Taylor Spiral Pipe would in *most* cases handle the job with a big saving of now-vital steel! It's a fact too, that a big dollar saving usually results . . . that the installed cost of Taylor Spiral Pipe is often no more than half that of standard thickness pipe.

Yes, switching to Taylor Spiral Pipe saves money and conserves steel. Use it for all such services as those listed here.

Change to TAYLOR SPIRAL PIPE FOR:

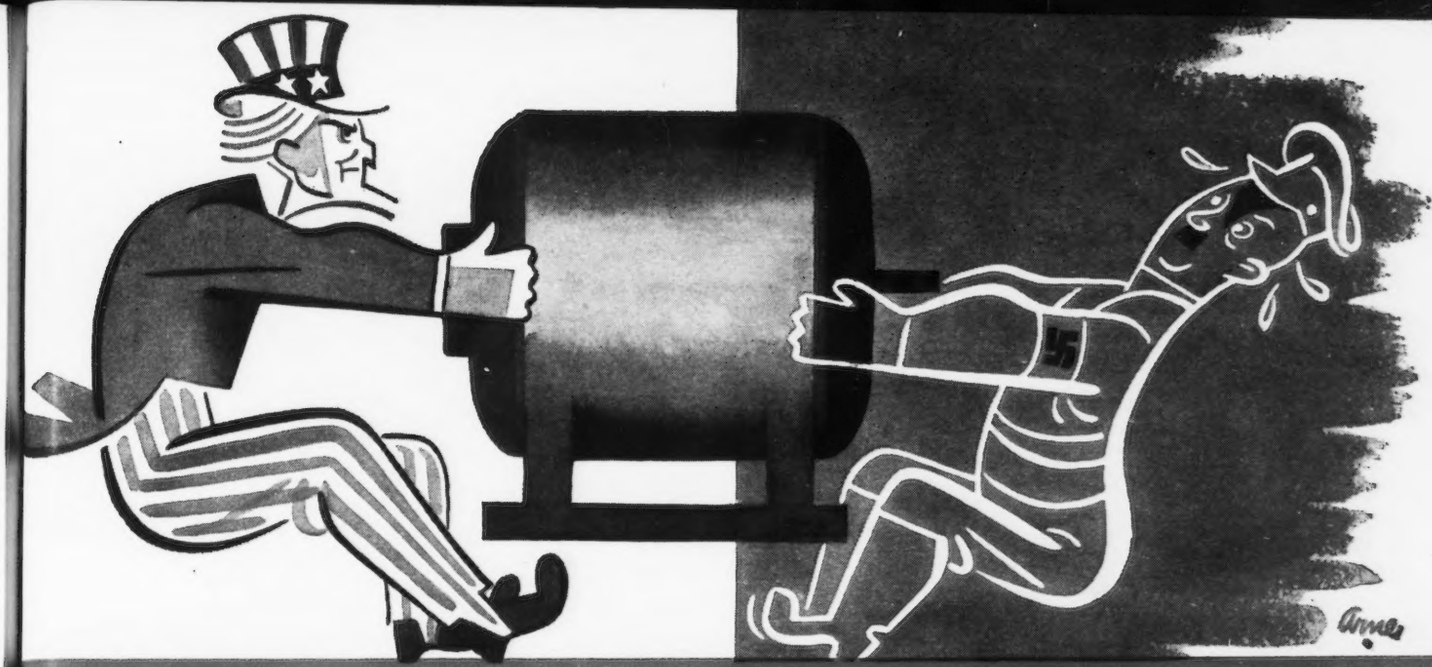
- High and Low Pressure Water Lines.
- Low Pressure Steam and Air Lines.
- Steam and Diesel Exhaust Lines.
- Vacuum and Suction Lines.
- Blower Piping.
- Sand and Gravel Lines.
- Industrial Gas Lines.
- Oil and Gas Gathering Lines.
- Swing Pipe.
- Spray Pond Piping.
- Hydraulic Mining.
- Dredge Lines.

The broad range of Taylor Spiral Pipe fits it into this scheme of better pipe selection perfectly. Sizes range from 4 to 42 inches—thicknesses from 18 to 8 gauge. All types of end joints; all kinds of fittings, "specials" and fabricated assemblies are produced by Taylor Forge, assuring complete service and undivided responsibility.

TAYLOR FORGE & PIPE WORKS

General Office & Works: Chicago P.O. Box 485
New York Office: 50 Church Street
Philadelphia Office: Broad Street Station Bldg.

TAYLOR *Spiral* PIPE



HOW MUCH OF YOUR MOTOR CAPACITY IS ON THE ENEMY'S SIDE?

APPLY THIS GUIDE

(based on recommendations of WPB)

TO DECIDE UPON MOTOR SIZE

1. For open-type a-c motors (continuous rated 40 C) where ambient temperatures are generally below 40 C, use motors rated as low as 80% of actual required horsepower. EXAMPLE: Where 9.3 is required horsepower—9.3 x .80 = 7.44; select a 7.5-hp motor.

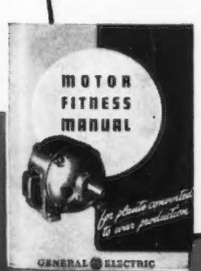
2. For a-c or d-c motors rated on a 50 C or 55 C basis, where ambient temperatures are generally below 40 C, use motors rated as low as 91% of actual required horsepower.

3. For open-type d-c motors (continuous rated 40 C) where ambient temperatures are generally below 40 C, use motors rated as low as 87% of actual required horsepower.

4. In selecting motor types, base your choice on these conservation factors, wherever operating conditions permit:

Use standard open motors instead of "specials"—high-speed instead of low-speed—single-speed instead of multiple—single-winding rather than two-winding—a-c instead of d-c—squirrel-cage instead of slip-ring—440-volt motors instead of 220 (or use 2200 volts above 100 hp).

An up-to-the-minute guide on wartime motor selection is now included with each copy of the G-E MOTOR FITNESS MANUAL, a booklet prepared to help you get the most out of every motor you now have in service. For your copy, call or write your local G-E office.



MOTORS NEEDLESSLY LARGE FOR THE JOB—plus the oversize distribution circuits they require—may be 25 per cent or more on the side of the Axis! That's the percentage of copper and other scarce materials frequently wasted by overcautious motor specifications—by buying the "next larger size" than a machine actually needs.

The extra amount of critical material used in the oversize motor itself is only part of the loss. Operating a motor continuously below its rated capacity can mean wasted copper all the way back to the power plant. Thus, even your present motors should be so applied as to avoid "over motoring," wherever possible.

The WPB joins in urging you to modify your peacetime motor policy in the cause of conservation. By following its recommendations whenever you buy or install a motor, you'll be helping to make more metals available where they're most needed to win the war. *General Electric, Schenectady, N. Y.*

The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in six plants manufacturing naval equipment.

BUILDER OF TRI-CLAD MOTORS

GENERAL ELECTRIC

150-173-8030

SEGREGATED *Scrap...* is your link to VICTORY!

Scrap salvage is a vital factor in the war effort. To be fully effective a scrap program must include methods for segregating and conserving critical alloying elements so urgently needed in the construction of tanks, guns, ships and planes.

Ferrous and non-ferrous metal scrap should be collected in separate containers at the machine where they are generated. Each class of high-speed tool steel and each type of constructional alloy steel should likewise be kept separate so that the alloy content can be returned to service.

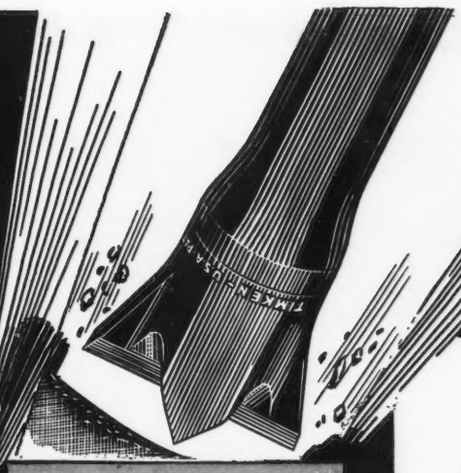
Remember, — alloy scrap which is segregated, classified and labeled according to type and composition is a vitally important commodity today—and urgently needed to augment primary supplies of Nickel, molybdenum, tungsten, etc.

The metallurgical experience of our technical staff is available to aid you in these and other phases of metal salvage.

KEEP SCRAP MOVING INTO WAR PRODUCTION!

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK, N. Y.

THE START OF A TANK!

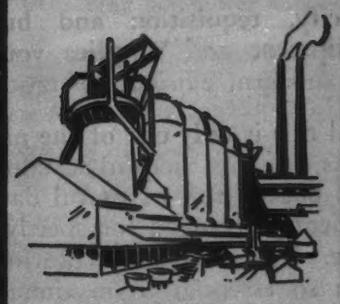


Drilling a hole in the ground may not be so spectacular as America's matchless tank, gun or plane production lines. But it's primary to nearly all armament production and fabrication where iron, copper, lead, zinc, nickel, molybdenum, limestone and coal are used. Drilling is literally the start of a tank, gun, plane or ship!

"Keep 'em drilling" (and drilling fast) is fully as important, in fact a pre-requisite to "Keep 'em rolling." Yes, the importance of fast drilling can hardly be overemphasized. The advantages of Timken Removable Rock Bits in this connection deserve your most careful consideration.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

FROM THE MINE



TO THE SMELTER

TO THE MILL

TO THE FACTORY WHICH MAKES THE TANKS . . .

Hundreds of operators changed to Timken Bits before the war. If you are not using them now you have, today, more to gain than the mines who had reason to adopt them years ago.

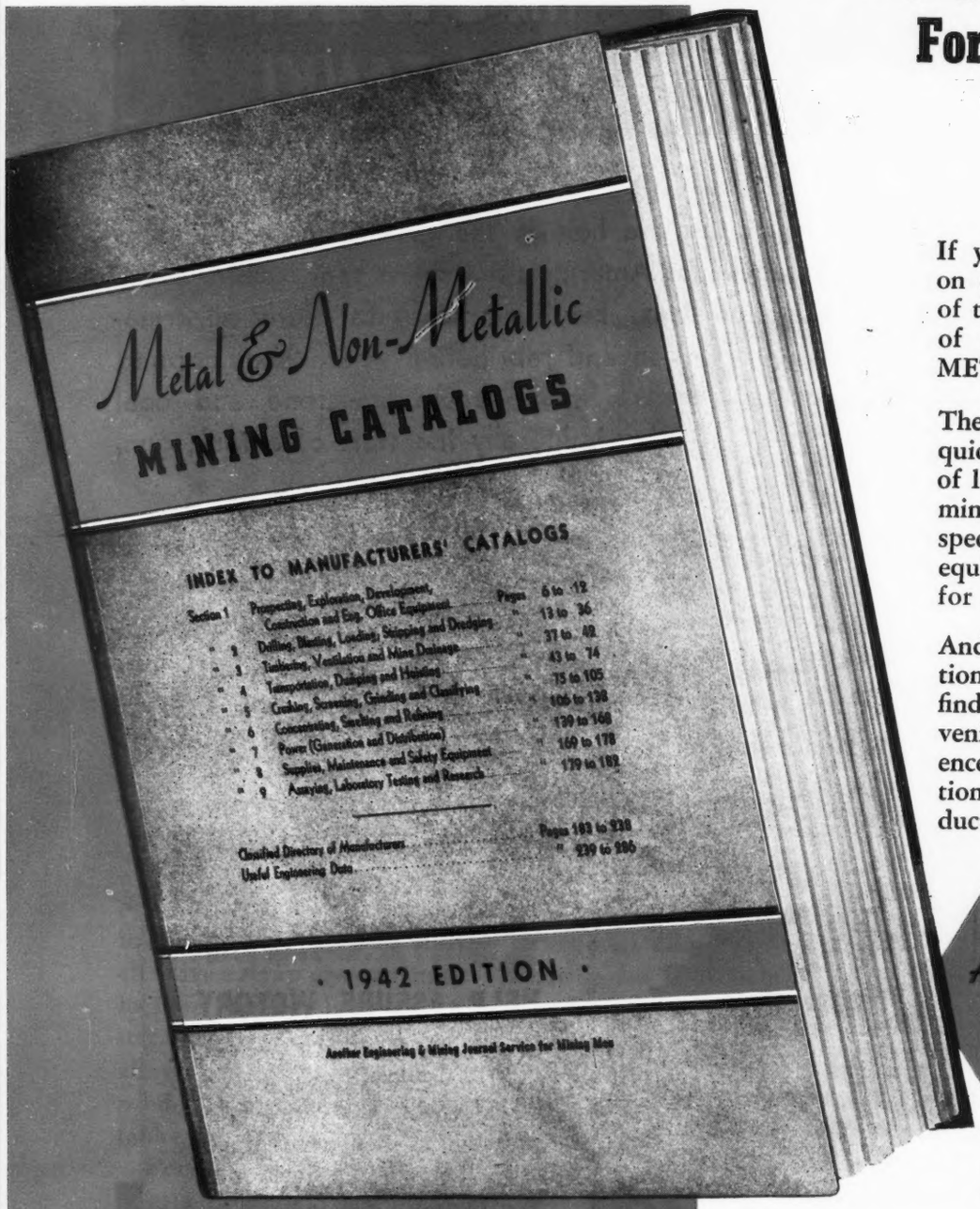
TIMKEN

HELP ASSURE VICTORY

Buy War Bonds. Conserve Rubber. Eliminate Unnecessary Travel. Use the Telephone Only When Important. Salvage All Scrap and Waste Material.

YOURS FOR THE ASKING!

•• MANUFACTURERS' CATALOGS of Equipment and Supplies For CONCENTRATING SMELTING, and REFINING


Metal & Non-Metallic
MINING CATALOGS
INDEX TO MANUFACTURERS' CATALOGS
Section 1 Prospecting, Exploration, Development, Construction and Eng. Office Equipment Pages 6 to 12
" 2 Drilling, Blasting, Loading, Stripping and Dredging " 13 to 36
" 3 Timbering, Ventilation and Mine Drainage " 37 to 42
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" 7 Power (Generation and Distribution) " 139 to 168
" 8 Supplies, Maintenance and Safety Equipment " 169 to 178
" 9 Analysis, Laboratory Testing and Research " 179 to 182
Classified Directory of Manufacturers Pages 183 to 238
Useful Engineering Data " 239 to 286
· 1942 EDITION ·
Another Engineering & Mining Journal Service for Mining Men

If you're looking for catalog data on equipment and supplies for any of these operations, turn to page 106 of your 1942 METAL & NON-METALLIC MINING CATALOGS.

There you'll find indexed for quick, easy reference the catalogs of leading manufacturers—up-to-the-minute data that will help you specify, requisition and buy the equipment and supplies you need for modern, efficient operation.

And this is only one of the nine sections in this helpful catalog you find packed full of useful data conveniently arranged for speedy reference. Use it daily for the information so essential to maximum production.

A Free Engineering & Mining Journal *Service to Mining Men*

Today, where every minute saved means increased tonnage for essential war effort, you'll find METAL & NON-METALLIC MINING CATALOGS more helpful and useful than ever before in your specifying, requisitioning and buying. In improved sectionalized form, with the latest catalog data from manufacturers, this new 1942 edition is one catalog you'll keep right at your elbow for daily, speedy reference.

Send For Your Copy TODAY!

If you are responsible for the specifying, requisitioning, or buying at your mechanized property, and haven't readily available your free copy of the New 1942 Edition, *request it immediately.* Write us on your letterhead, telling us about your property, or use the coupon. We'll see that you receive your copy by return mail.

Free—USE THIS HANDY COUPON

E.&M.J., December, '42

METAL & NON-METALLIC MINING CATALOGS,
330 West 42nd St., New York, N. Y.

Gentlemen: I am responsible for specifying, requisitioning or buying equipment and supplies needed at our property, and do not have access to METAL & NON-METALLIC MINING CATALOGS. Please forward me a copy of the 1942 Edition immediately. (If my country imposes a duty on such Catalog books, I agree to pay same).

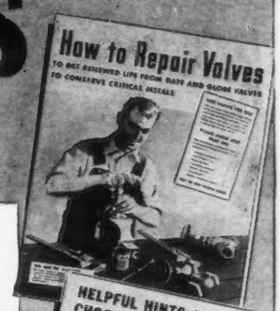
Name ..... *Title*.....

Company Name .....

City Address..... *State*.....

The nature of our operation is.....

IT'S EASIER WITH "PIPING POINTERS"

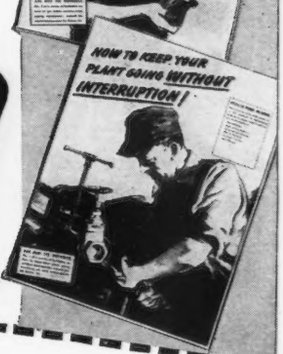


1. TO TRAIN NEW PIPING MAINTENANCE MEN

"Piping Pointers" Bulletins give them countless *do's* and *don'ts* and *rights and wrongs* that make for better installed and better operating pipe lines. The information is clear, concise, fully illustrated. Coming from Crane—leading maker of valves and fittings—you may be sure it is sound and practical. Use "Piping Pointers" as text material as so many important firms are now doing to help themselves in the worsening manpower situation.

2. TO KEEP VETERANS UP-TO-DATE ON WAR-TIME PRACTICES

Not all information in "Piping Pointers" is solely for trainees. The range of subjects is varied and applies to men who swing the wrenches, and whose job it is to make your piping systems work better and last longer under war operating conditions. Skilled workers say they like to keep "Piping Pointers" handy for *brushing up,* and know they're reliable because they're issued by Crane.



GET AND USE THIS SERVICE *NOW* WHEN MOST VALUABLE

Inevitable materials shortages make better maintenance of piping a dire necessity. Everywhere, leading plants acknowledge the valuable aid of "Piping Pointers" Bulletins in training men for this job. Whether large or small, your plant will get equal benefit from this *free* Crane *Aid-to-Victory* Service. Use the coupon—or ask your Crane Representative for copies.

CRANE

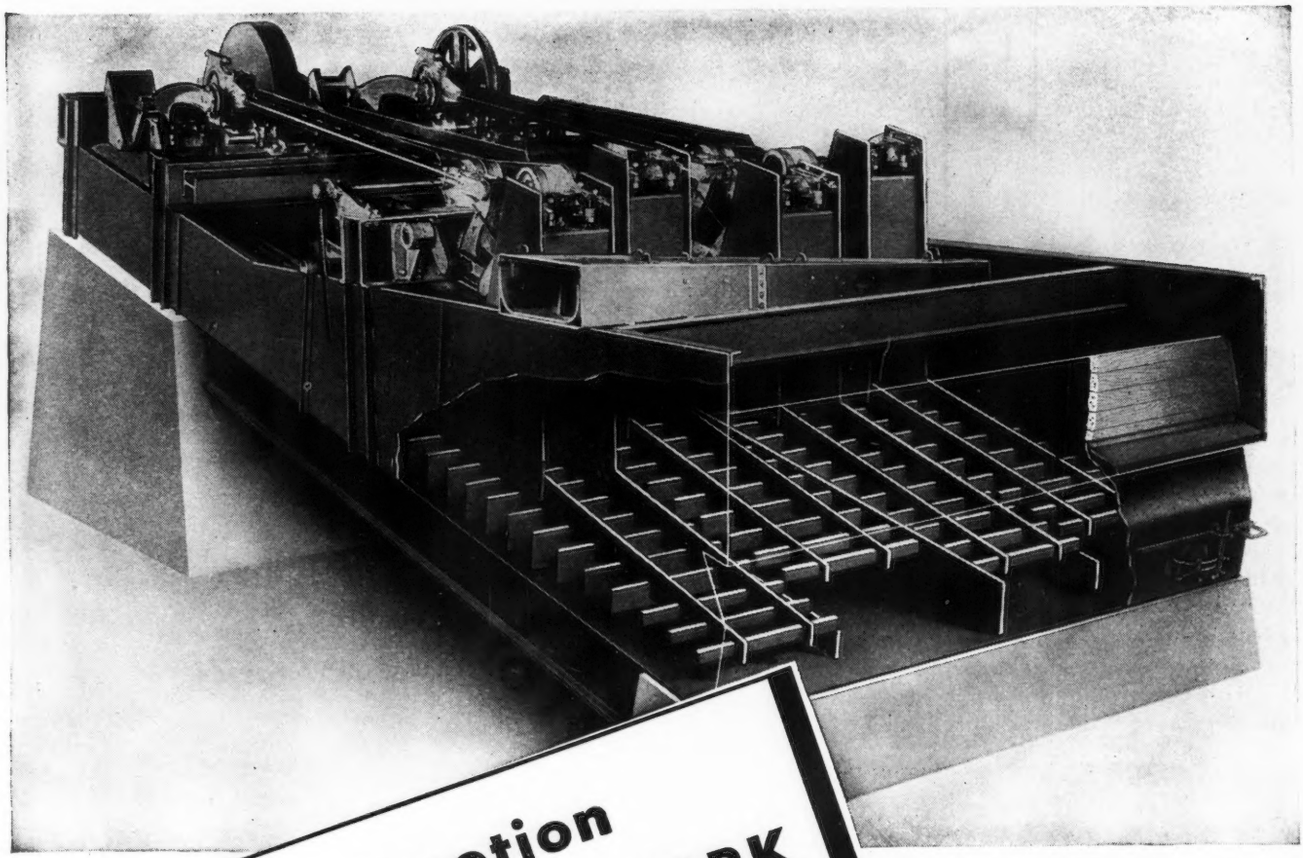
CRANE CO., GENERAL OFFICES: 836 S. MICHIGAN AVE., CHICAGO

VALVES • FITTINGS • PIPE
PLUMBING • HEATING • PUMPS

NATION-WIDE SERVICE THROUGH BRANCHES AND WHOLESALERS IN ALL MARKETS

CRANE CO.
836 S. Michigan Avenue, Chicago Illinois EMJ
Rush me .... set(s) of "Piping Pointers" Bulletins.
No obligation, of course.

Name .....
Title .....
Company .....
Address .....
City ..... *State* .....



On a headmotion ...designed for WORK

• *Built by* THE DORR CO., INC.

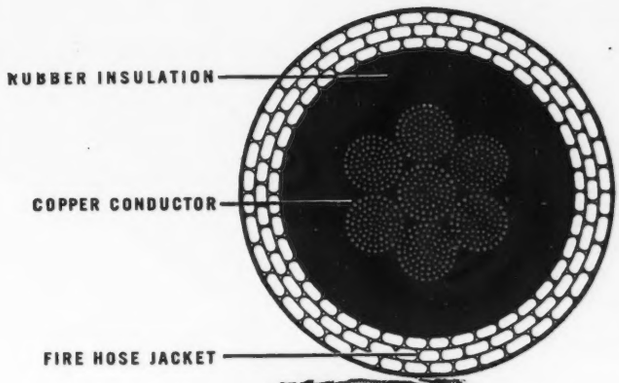
Backward and forward — up and down — day after day — year after year go the 8″ rake blades on this heavy duty Dorr FX Classifier with capacities up to 1000 tons per day per foot of rake width. And on the crankpin location are SKF Spherical Roller Bearings that have high load capacity, equalized load distribution, inherent rolling alignment — everything a bearing should have to enable a machine to do a better job. When machines are designed for WORK, they're usually designed with SKF's. 5174

SKF INDUSTRIES, INC., FRONT ST. & ERIE AVE., PHILA.

SKF

BALL AND ROLLER BEARINGS

Duracord helps two ways...



1. Saves up to 50% rubber in mining cable

2. Saves down-time losses in vital mine production

THERE is nothing "ersatz" about Duracord*; it is a cable construction developed during the last war to meet the need for heavy-duty cords and cables . . . a need it is *currently* filling not only in mines but also industrial plants and shipyards.

The Duracord covering is woven like a fine hose—*not braided.* This tough yet flexible cover replaces the rubber jacket on all-rubber cords making possible rubber savings as high as 50%.

For further information, please send us your inquiries.

SUNEX SECURITYFLEX* TO WAR

This well-known all-rubber companion to Duracord has been preempted for the toughest kind of jobs in the war effort where all-rubber cord is mandatory. Until peace, its use will be strictly regulated. 42256

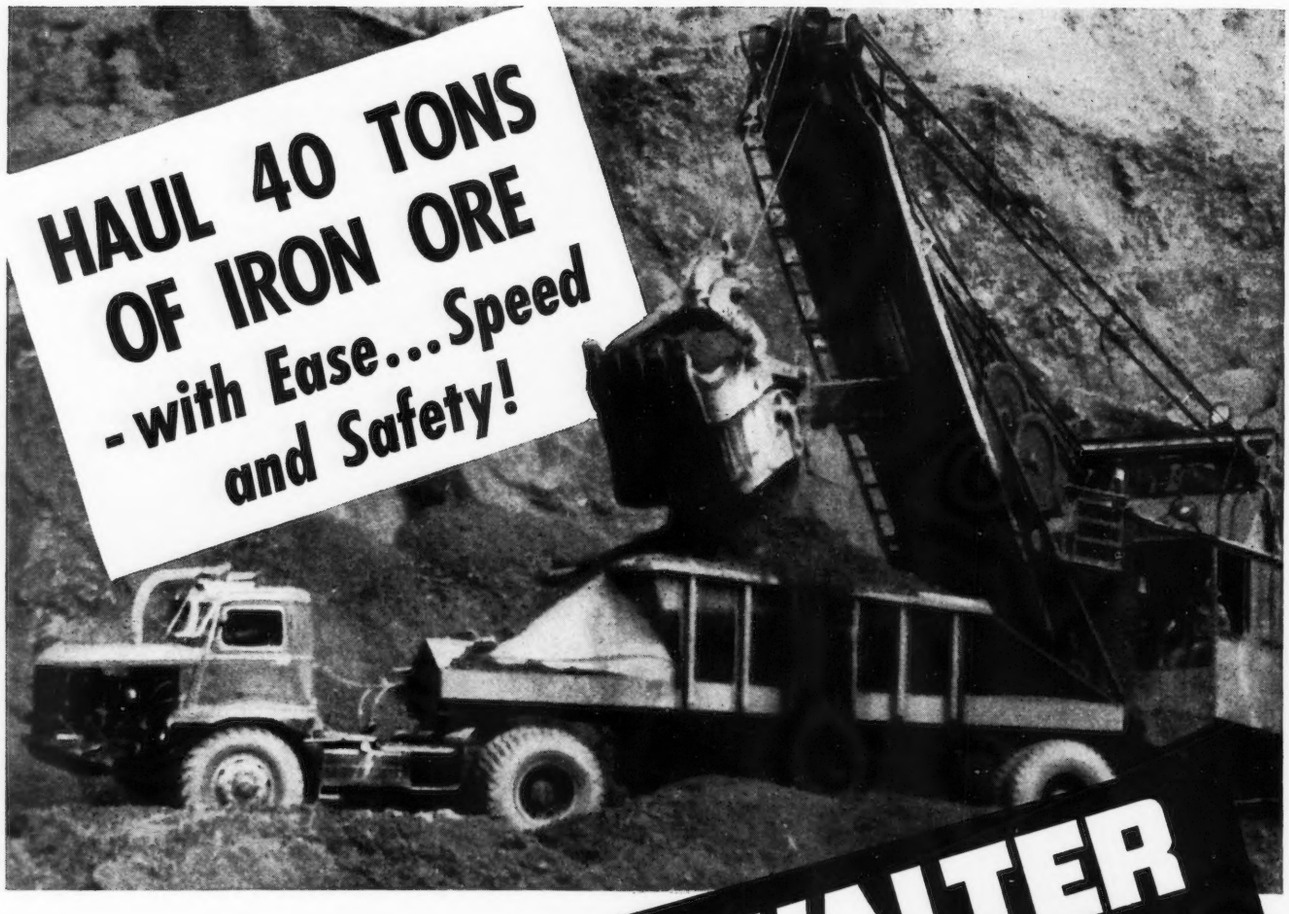
*Reg. U.S. Pat. Off.

Two marks of achievement – the cherished Navy "E" (awarded to two of our plants) for achievement in production... The Anaconda trade-mark for achievement in quality.

ANACONDA WIRE & CABLE COMPANY
Subsidiary of Anaconda Copper Mining Co.
General Offices: 25 Broadway, New York
Chicago Office: 20 North Wacker Drive
Sales Offices in Principal Cities

Sunex Securityflex and Duracord

ANACONDA WIRE & CABLE COMPANY



WALTER
Four-Point Positive Drive
TRACTOR TRUCKS

THESE past years of record iron ore production have forcibly demonstrated the many advantages of Walter Tractor Trucks. Specially designed, powered and built for the needs of open pit mines, these giant units have made possible the hauling of 40 ton pay-loads with the speed, safety, easy handling and maneuverability of smaller trucks.

Carrying full 40 tons, in a special 20 yd. hydraulically operated bottom door trailer, Walter Tractor Trucks travel 25 m.p.h. on level stretches, 5 m.p.h. up 10% grades. The tremendous power of the 200 H.P. Diesel motor is fully utilized by the exclusive Walter 4-Point Positive Drive system. Automatic lock differentials proportion the power to each of the four driving wheels according to its traction, providing steady pulling power on soft, slippery surfaces and grades.

Power hydraulic steering reduces driver fatigue . . . air brakes assure powerful braking—short wheelbase permits easy maneuvering in small space and sharp turns. Write for detailed information.

WALTER MOTOR TRUCK CO.
1001-19 Irving Avenue, Ridgewood, Queens, L. I., N. Y.

NEW! 35-TON SIDE DUMP TRAILER FOR OVERBURDEN!

Designed especially for handling large rocks and overburden. Carries 35 ton load—permits convenient side dumping. It is hauled by the same type 200 h.p. diesel Walter Tractor Truck used in ore hauling operations. Write for details.

A whole year's tips on a handy tag...
TO GO WHERE IT'S NEEDED MOST

HOW TO MAKE WIRE ROPE LAST

INSTALL PROPERLY

Avoid kinks by proper unreeling and uncoiling:

Mount reel on jacks or substantial cribbing.

Roll coil along floor.

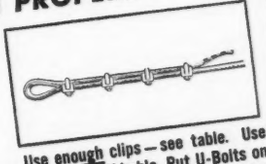
SPOOL CORRECTLY THE FIRST TIME:

Wind all wraps on tight.
Make each turn fit snug.
Do not interlock strands.

PUT CLIPS ON PROPERLY:

NUMBER OF CLIPS REQUIRED FOR "BLUE CENTER" STEEL WIRE ROPES

Rope Diameter	Number of Clips	Spacing of Clips	Length of Wrench
½" to ⅝"	4	3½" to 4¼"	12"
¾" to ⅞"	5	5" to 5¾"	18"
1" to 1⅛"	6	6½" to 7¼"	24"
1¼" to 1⅜"	7	8" to 8¾"	24"
1½"	8	9½"	24"



Use enough clips — see table. Use a wire-rope thimble. Put U-Bolts on dead end of rope. Retighten clips after running one hour.

ALL THROUGH 1942, our advertising has brought you much valuable information on how to install wire rope, how to maintain and inspect it, how, in brief, to make it last as long as possible.

Many of you executives and operating men have expressed a desire to pass along this information in simple, handy form to your men who really handle the rope, so they'll be able to use it right on the job.

Here they are—a whole year's tips on wire-rope conservation — on a sturdy, convenient tag you can have fastened right to equipment, on controls, or to the wire rope itself.

Printed on heavy stock and varnished for further protection, the tags are ideal for use right on the job — durable, washable, always legible. And they're yours for the asking! *WRITE FOR "TAG A".*

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, NEW JERSEY
Branches and Warehouses in Principal Cities

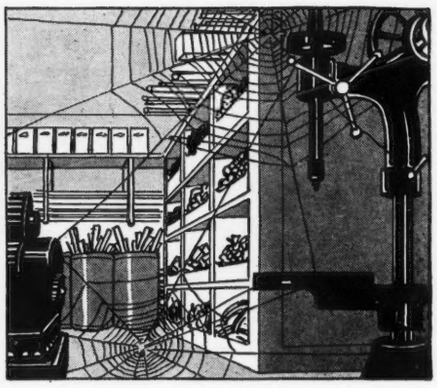
★ PROMPT SERVICE
★ on essential orders
★ from warehouse
★ stocks or mill

ROEBLING
"Blue Center"
STEEL WIRE ROPE
PREFORMED OR NON-PREFORMED

Collect Your Scrap

1. Segregate your *regular scrap*—turnings, stampings, filings, all the metal waste produced in your plant—by its alloy content. You thus insure its re-use where it is needed most—and you also get a higher price for the scrap.

2. Clean out your *junk*—old or obsolete machinery, pipe, pumps, shafting, dies, jigs, tools, engines, electrical apparatus—the abandoned equipment that is overlooked in routine scrap collections. All this metal can be used now.

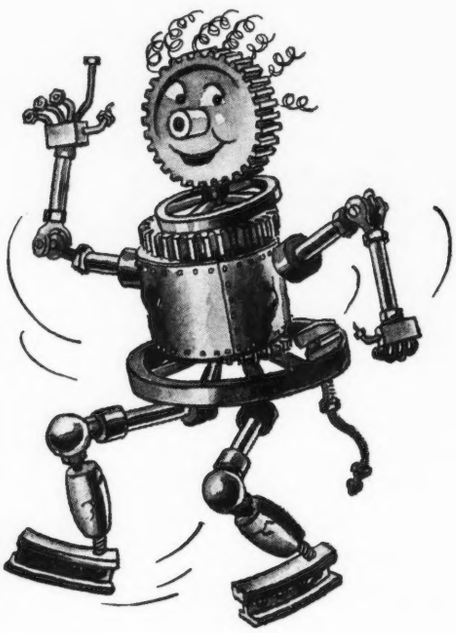


3. Turn in the *cobweb* scrap—the equipment that has been gathering dust in the corner for an emergency. Outdated machinery and tools, extra fixtures, patterns, stocks, unused metal buildings—they are needed today.

SCRAPPY SAYS:

Yes sir, we've got to have scrap. It takes scrap to make steel. And it takes lots of steel to win a war. If you aren't already regularly selling your scrap,

HERE'S WHAT TO DO:



Call your junk man . . . or send it to the collection station for the Local Salvage Committee . . .

or give it to the Boy and Girl Scouts or other Civic Collection Agencies.

Your scrap will be removed promptly and speeded on its way to steel mills for re-use. The faster your plant contributes its unused or waste metal, the sooner that metal can be put to work again—in guns, tanks, and planes.

For further information, get in touch with your local WPB office, or write to the Bureau of Industrial Conservation, War Production Board, Washington, D. C.

ELECTRO METALLURGICAL COMPANY

Unit of Union Carbide and Carbon Corporation

UCC

30 East 42nd Street, New York, N. Y.

Electromet
Trade Mark
Ferro-Alloys & Metals

HAZARD WIRE ROPES ARE *Uniform*

Yes, and IN UNIFORM

Since 1846, Hazard wire ropes have been famous for their uniformity—foot by foot, reel by reel. Uniform dependability is one of the big reasons why we have customers coming back for Hazard ropes, *continuously*, for 30, 40 and 50 years.

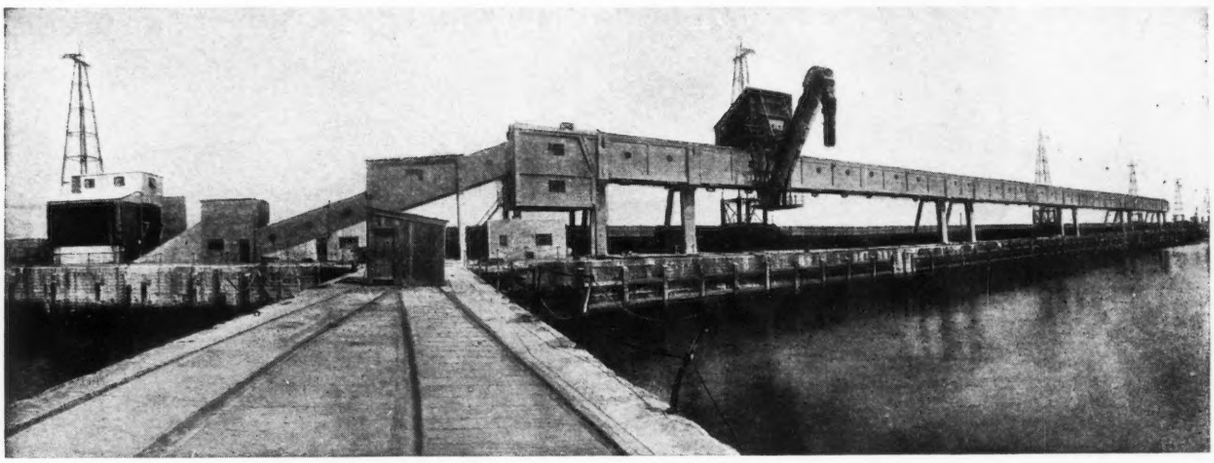
Today Hazard lines are not only uniform in quality but they are *in the uniform* of war work. They are being used for mine sweepers, torpedo nets, tethers for observation balloons, balloon barrage ropes, airplane controls, ship rigging, hoist ropes for lifting aerial bombs into place in bombers, winch ropes for Army motor trucks and tractors, ropes for airplanes and artillery, glider tows, parachute flares, parachute rip cords, firing controls on tanks and heavy gun mounts, shipyard crane ropes, etc., etc. Much of this rope is **HAZARD LAY-SET** Preformed Green Strand—the rope that lasts longer because it is free from internal stress. It is also easier and safer to handle, resists kinking, whipping or rotating in sheave grooves. Some of the rope is **HAZARD "NONPAREIL"**—the rope that represents 96 years of wire rope-making experience, known to "old timers" as well as the younger operators as the line that gets the job done efficiently and economically.

HAZARD WIRE ROPE DIVISION Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Fort Worth, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Tacoma

AMERICAN CHAIN & CABLE COMPANY, INC. BRIDGEPORT, CONNECTICUT

HAZARD LAY-SET *Preformed* WIRE ROPE

FOR LOADING AND UNLOADING PLANTS



OF ANY CAPACITY

CONSULT FRASER & CHALMERS ENGINEERING WORKS

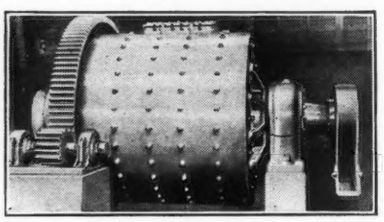
Many of the largest handling plants in all parts of the world, handling up to thousands of tons per hour, testify to the unrivalled experience of this company in the design, manufacture and installation of handling plants. For mining plants especially—conveying, crushing, screening and grading—this expert knowledge can prove exceptionally helpful.

FRASER & CHALMERS ENGINEERING WORKS

(Proprietors, The General Electric Co., Ltd. of England) London, England; Magnet House, Kingsway, W.C.

Associated with Robins Conveying Belt Co.

RIB-CONE BALL MILLS *FIT THE JOB!*



For every grinding job, whether it's coarse grinding or fine grinding, there's a Rib-cone ball mill to fit the job. Over 100 sizes and types are available: Screening, screenless, low pulp line or plain overflow types. For remote locations, Rib-cones are sectionalized for easy transport.

We also build KUE-KEN balanced crushers, Straub Universal concentrating tables, vibrating screens, or feeders, water tube boilers, furnaces, etc. Bulletin 302 describes the above equipment in detail.

STRAUB MFG. CO.
468 CHESTNUT ST.
OAKLAND, CALIF.

PLACER GOLD

Most accurately and economically tested for . . . with the

EMPIRE DRILL

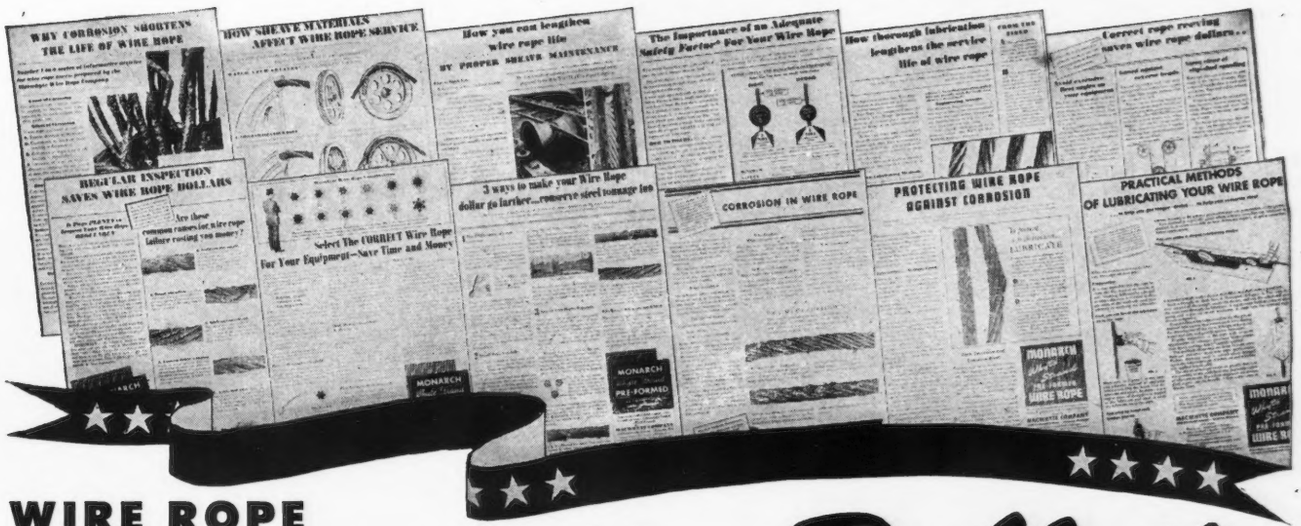
NEW YORK ENGINEERING COMPANY
75 West St., N. Y. City, U. S. A. Cable Address, NYECO, N.Y.

G.N.S. No. 5 PINE OIL

LONG THE STANDARD FROTHING OIL

For Flotation

NEWPORT INDUSTRIES, Inc.
230 Park Avenue New York, N.Y.


WHY CORROSION SHORTENS THE LIFE OF WIRE ROPE
HOW SHEAVE MATERIALS AFFECT WIRE ROPE SERVICE
How you can lengthen wire rope life BY PROPER SHEAVE MAINTENANCE
The Importance of an Adequate Safety Factor For Your Wire Rope
How thorough lubrication lengthens the service life of wire rope
Correct rope reeving saves wire rope dollars...
REGULAR INSPECTION SAVES WIRE ROPE DOLLARS
Select The CORRECT Wire Rope For Your Equipment—Save Time and Money
3 ways to make your Wire Rope dollar go farther...conserve steel tonnage too
CORROSION IN WIRE ROPE
PROTECTING WIRE ROPE AGAINST CORROSION
PRACTICAL METHODS OF LUBRICATING YOUR WIRE ROPE
MONARCH
PRE-FORMED
WIRE ROPE

WIRE ROPE *Conservation Bulletins* SENT ON REQUEST

We pause in this series of informative articles for wire rope users to review briefly the 12 thus far published . . . and provide an opportunity for those who may not have seen them to obtain reprints.

The purpose of this series of single-page illustrated articles on wire rope conservation is to help you conserve your wire ropes. This helps you, and helps our country for it means conservation of steel. We shall be glad to send you any or all of the articles listed below which readers tell us are useful and helpful.

1 ***Why Corrosion Shortens the Life of Wire Rope.*** Tells cause, effect, and suggests remedy for corrosion. Also explains how proper lubrication helps wire rope stand up against elements.

2 ***How Sheave Materials Affect Wire Rope Service.*** Pictures effect of hard and soft sheaves on wire rope. Explains what to watch for, how to avoid rope and sheave damage.

3 ***How You Can Lengthen Wire Rope Life by Proper Sheave Maintenance.*** Includes handy reference table on groove tolerances. Also points out 3 ways to save wire rope dollars.

4 ***The Importance of an Adequate Safety Factor.*** What is it? How Found? When is wire rope overloaded? What are minimum safety factors for various loads? All are answered in this easy-to-read, informative article.

5 ***How Thorough Lubrication Lengthens Service Life of Wire Rope.*** Explains two lubricating methods. Shows effect (Pictures) of ropes left unprotected.

6 ***Correct Rope Reeving Saves Wire Rope Dollars.*** Discusses fleet angles, reverse bends, rope spooling and what to do about them.

7 ***Regular Inspection Saves Wire Rope Dollars.*** Lists 6 common causes of wire rope failure. All can be avoided if rope user follows simple inspection procedure suggested.

8 ***Select the Correct Wire Rope for Your Equipment—Save Time and Money.*** Explains how Flexibility, Abrasion Resistance, and Strength are determined to meet varying conditions of Bending Fatigue, Abrasive Wear, and Loading Stress.

9 ***3 Ways to Make Your Wire Rope Dollar Go Farther—Conserve Steel Tonnage Too.*** Especially valuable to men actually handling wire rope.

10 ***Corrosion in Wire Rope.*** Gives further information on how to combat this rope destroyer. Supplements informative article number 1.

11 ***Protecting Wire Rope Against Corrosion.*** Shows some results of forgetting to inspect and protect wire rope with proper lubrication.

12 ***Practical Methods of Lubricating Your Wire Rope.*** Illustrates simple ways to lubricate your wire rope on the job. Very practical, useful for everyone concerned with wire rope care.

MACWHYTE COMPANY Manufactures:

- MACWHYTE PREformed and Internally Lubricated Wire Rope
- MONARCH WHYTE STRAND Wire Rope
- MACWHYTE Special Traction Elevator Cable
- MACWHYTE Braided Wire Rope Slings
- MACWHYTE Aircraft Cables and Tie Rods

MACWHYTE COMPANY, 2940 Fourteenth Ave., Kenosha, Wis. • *Mill Depots:* New York • Pittsburgh Chicago • Ft. Worth • Portland • Seattle • San Francisco • *Distributors throughout the U. S. A.*

NO. 646

How to get them

Just circle those you wish and attach coupon to, or write on, your business letterhead.

Macwhyte Company
2940 Fourteenth Ave.
Kenosha, Wisconsin

1 2 3 4 5 6
7 8 9 10 11 12

I would like reprints of informative articles on wire rope conservation which you have published recently. I have circled those I wish.

Name _____

Title _____

Company _____

Co. Address _____

City _____ *State* _____

"I'll bet he

The two mine operators couldn't understand it. So far this year, they both were turning out a higher average tonnage than ever before, with some days very good and some not so good. But Bill Riggs, over there! Day in, day out, his tonnage figures were consistently high. He never seemed to have an off day. Never seemed to run into the headaches they had at every turn. Was it luck, they wondered?

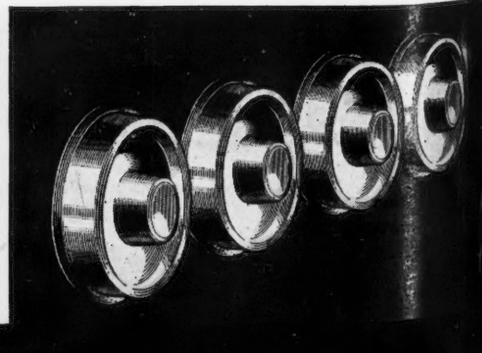
Perhaps it was more than a horseshoe. Perhaps his record was due to the extra care he took at every turn to prevent those small but costly breakdowns and stoppages. It might have been, for instance, due partly to his choice of Bethlehem equipment.

Bethlehem mine equipment helps prevent breakdowns and promotes efficient operation because it is built with an extra margin of safety. Look at the four Bethlehem products featured below. Note how the sturdy construction of each makes it better able to stand up to today's forced-draft mine operation.

Bethlehem's Form-Set Preformed Wire Rope resists kinks, is easier to handle, and thus cuts down delays. As you can imagine, these qualities are doubly valuable when you are working in the cramped quarters of a 3-ft. ceiling. Form-Set Wire Rope can also be installed easier and in a shorter time because of its flexibility and relaxed condition. It has longer resistance to bending fatigue and does not "porcupine", thus avoiding injury to worker's hands.

More inches of hole per minute can be drilled with **Bethlehem's Superior Hollow Drill Steel**. That's the record of many a job with this remarkable drill steel. Bethlehem Superior outperforms others because it is made of a special fatigue-resisting steel, tough, and pretested to insure uniform response to heat-treating. In addition, the hole is accurately centered and tests show it is free from the pits and cracks that ordinarily cause fatigue failures.

Bethlehem's Forged Steel Mine Car Wheel has never failed! Ever since 1927 when introduced, not one flange or tread has ever cracked, chipped, or broken in service. No wonder many progressive mine operators using these wheels have cut their wheel failure losses to zero. Bethlehem Wheels perform like this because they are made of a grade of highly-uniform open-hearth steel and are thoroughly forged for greater strength, toughness, and resilience.



he carries a dozen horseshoes!"

"I rely on more than a horseshoe for my Victory tonnages . . . I rely on this Bethlehem equipment!"

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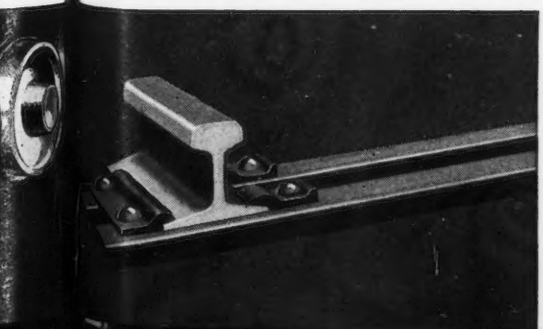

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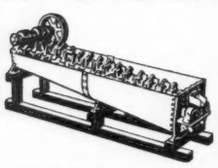

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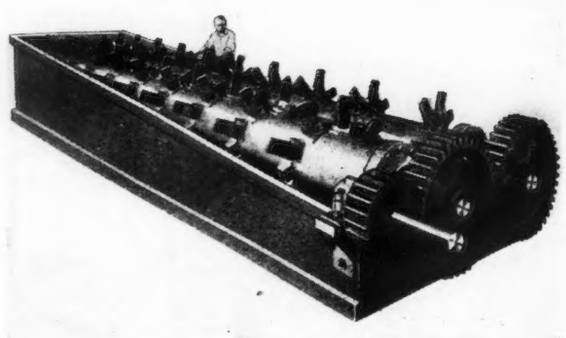

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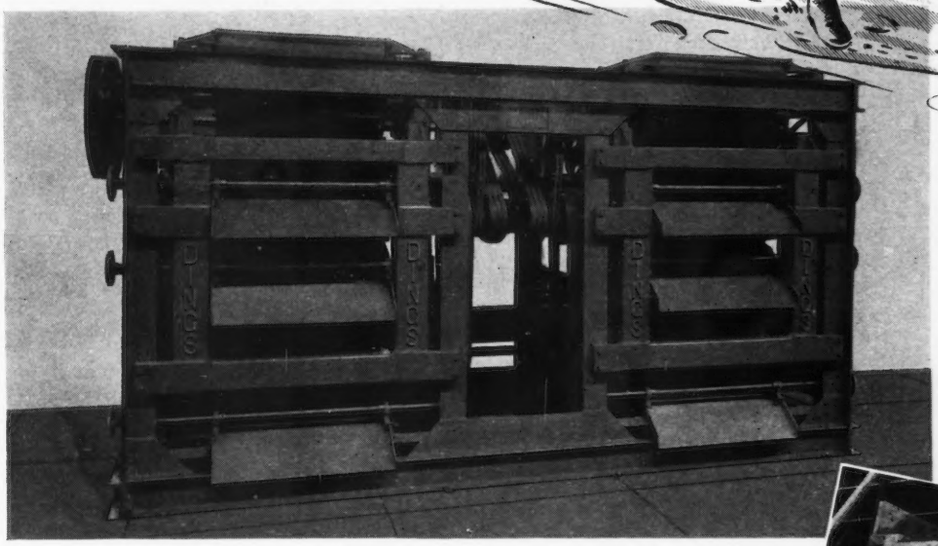

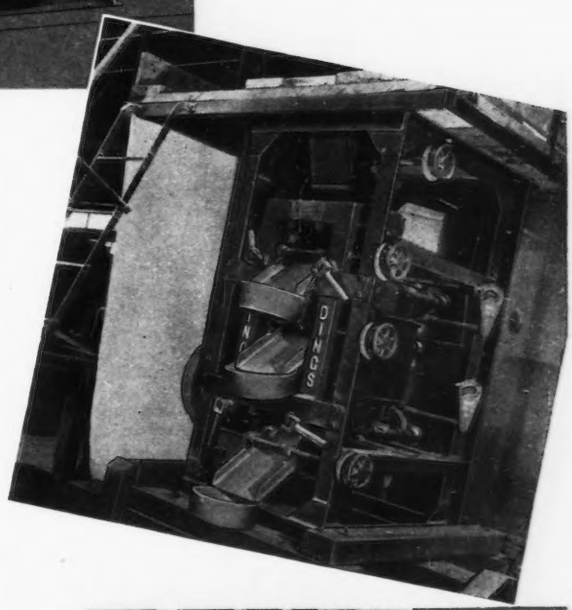

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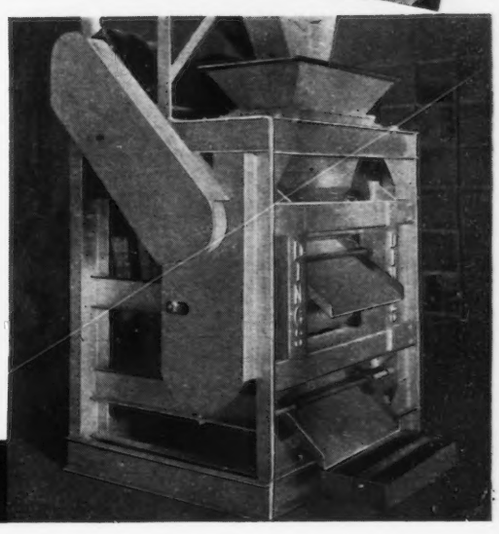

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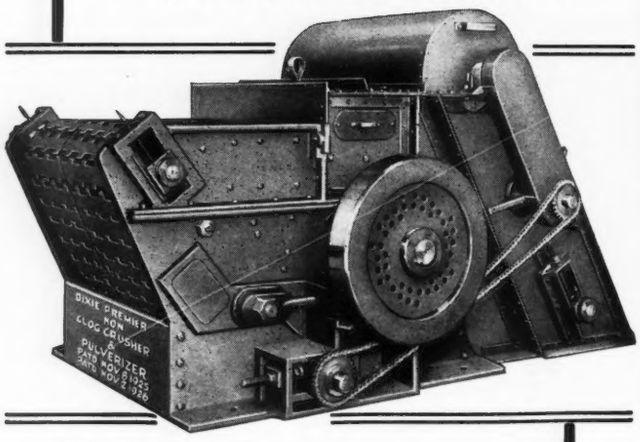

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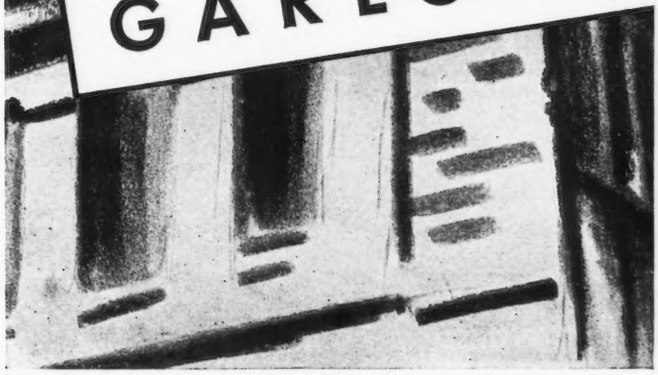

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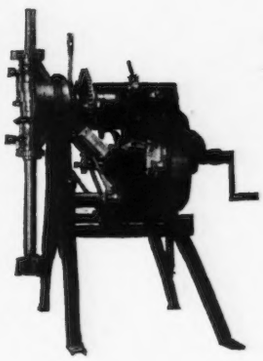

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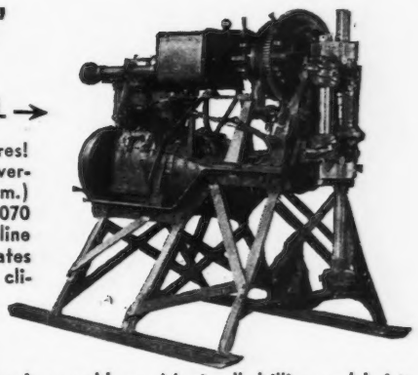

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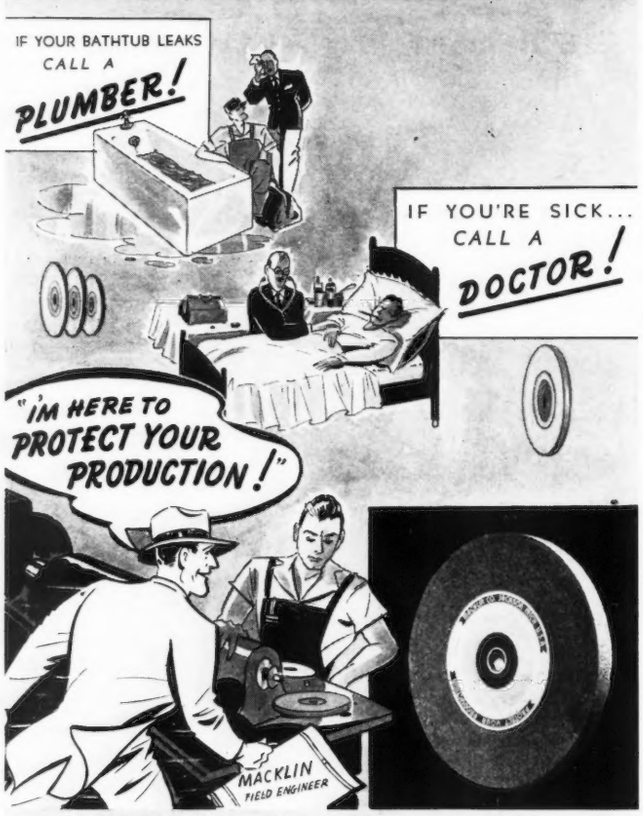

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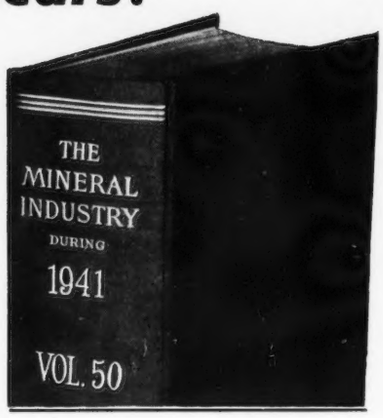

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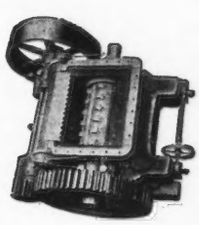

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(Additional For Sale ads on pages 157-158-159)

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1—300 K. W. Westinghouse Generator No. 1068665—Type Q Interpole; Compound Wound; 500 Amp., 600 V.
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1—No. 456 Cochrane Feed Water Heater; 1000 B.H.P. 48" x 56" x 90½"
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P-109, Engineering & Mining Journal
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WANTED

USED OR NEW: A radiation type pyrometer, Brown-Instrument, or Leeds Northrup, with range to 3200 degrees F. Harry C. Heath, Box 7, Riggins, Idaho.

MINING MEN WANTED

FOR WORK IN BOLIVIA

Mine Shift Bosses—$275. mo.
Junior Mine Engineers—$225. mo.

Three year contract. Must live singly for first 6 months. Spanish important! not necessary.
Transportation paid for men, not their families.
Hochschild tin, lead, tungsten mines.

P-119, Engineering & Mining Journal
330 West 42nd St., New York City

WANTED

METALLURGIST

Well established firm producing brass and bronze ingot metals in Middle West. Must be experienced and have thorough knowledge of materials and methods of control. Real opportunity for the right man.

P-121, Engineering & Mining Journal
520 No. Michigan Ave., Chicago, Ill.

CORE DRILLING
ANYWHERE
WE LOOK INTO THE EARTH
PENNSYLVANIA
DRILLING COMPANY
Pittsburgh, Pa.

For Lease or Sale

LEAD AND ZINC PROPERTIES

500 acres of Lead and Zinc properties in Taxco, near Mexico City, close to highway. Details furnished, after exchange of references, to responsible parties.

BO-98, Engineering & Mining Journal
330 W. 42nd St., New York City

Don't forget the

BOX NUMBER . . .

When answering the classified advertisements in this magazine, don't forget to put the box number on your envelope. It's our only means of identifying the advertisement you are answering.

DIVIDEND NOTICE

ANACONDA COPPER MINING CO.
25 Broadway
New York, N. Y. November 25, 1942.
DIVIDEND NO. 138
The Board of Directors of the Anaconda Copper Mining Company has declared a dividend of One Dollar ($1.00) per share upon its Capital Stock of the par value of $50. per share, payable December 21, 1942, to holders of such shares of record at the close of business at 3 o'clock P.M., on December 8, 1942.
JAS. DICKSON, Secretary & Treasurer

EQUIPMENT WANTED ADVERTISING SEE PAGE 158

MORSE RECONDITIONED MACHINERY IS DEPENDABLE

MOTOR GENERATOR SETS

1—12 K.W. M.G. Set; 15 HP
2—37½ K.W. Westinghouse Synchronous Rotary Converter M.G. Set; 20 HP
1—65 K.W. M.G. Set; 100 HP (G.E.)
1—70 K.W. Burke M.G. Set; 100 HP
1—75 K.W. Ridgway M.G. Set; 115 HP
1—75 K.W. G.E. M.G. Set; 125 HP
1—100 K.W. Hertner M.G. Set; 150 HP
1—100 K.W. Ideal M.G. Set; 150 HP
1—100 K.W. Crocker-Wheeler M.G. Set; 165 HP
1—100 K.W. Westinghouse Synchronous Converter M.G. Set
1—65 K.W. G.E. M.G. Set; 300 HP

SINKING PUMPS

1—3" Krogh 3-Stage, Vertical
1—12" 5-Stage Pomona, Vertical
1—12" 12-Stage Pomona, Turbine Type
1—3" Krogh 4-Stage, Vertical
1—10" 3-Stage Byron Jackson
1—4" 8-Stage Johnson
1—14" 10-Stage Layne & Bowler

BALL MILLS

1—4'x3' Morse Standard Mill
1—5'x7' Fraser & Chalmers
1—5'x16' Colorado Iron Works Tube Mill
1—6'x11' Allis-Chalmers
1—7'x6' Allis-Chalmers
2—8'x22" Hardinge Conical
1—No. 64½ Marcy, Grate Discharge

ASSAY BALANCES

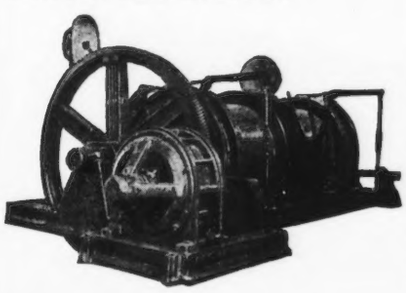
1—Type E Ainsworth, 1/200 Mg. Sensibility
1—Troemner, 1/200 Mg. Sensibility
1—Troemner, 1/50 Mg. Sensibility
1—Type F Ainsworth, 1/200 Mg. Sensibility
1—Troemner, 1/300 Mg. Sensibility
1—Ainsworth Type BM, 1/500 Mg. Sensibility (Inverted Beam)
1—Smith & Thompson, 1/200 Mg. Sensibility
1—Ainsworth 1/50 Mg. Sensibility
1—Ainsworth Type G, 1/100 Mg. Sensibility

DRYERS

1—36"x14' Ruggles-Coles; revolving
1—36"x14' Ruggles-Coles; dir. heat
2—42"x25' Flynn & Emrick

ELECTRIC HOIST

1—10 H.P. Single Drum, Box
1—15 H.P. M.B. Single Drum
4—20 H.P. Vulcan St. Frame Sgl. Drum
1—30 H.P. Vulcan St. Frame Sgl. Drum
1—35 H.P. Wash. I. Wks., S. D. Sect. Frame
1—50 H.P. Leyner—Sectionalized Frame
1—60 H.P. Vulcan—Steel Base



LOADERS

1—Eimco Finlay Mechanical Shovel
4—Jeffrey Coal Loaders
1—Conway Coal Shovel

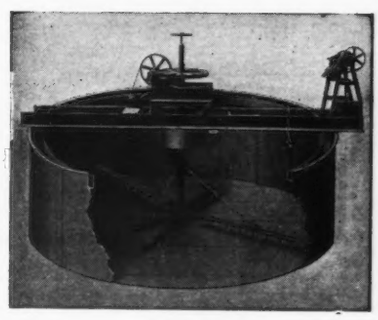
ROASTERS

1—60"x96" Bruckner Roasting Cyl.
1—6'x16' Bruckner-Rotary
1—10' diam. x 8 Hearth Walker
1—12'x6 Hearth Walker
1—12'x7 Hearth Walker
1—20"x8 Hearth Skinner Roaster

WATER WHEELS

1—20" Leffel Style 23 Double Discharge
1—24" Tutthill, C. I. Housing
1—36" Tutthill, C. I. Housing
3—38" Leffel Cascade Water Wheels

JACKHAMMERS—STOPERS DRIFTERS



THICKENERS

2—20' diameter Thickener Mechanism
2—24' diameter Thickener Mechanism
2—28' diameter Thickener Mechanism
2—30' diameter Thickener Mechanism
1—75' diameter Thickener Mechanism

ACETYLENE GENERATORS

1—Imperial, Size No. 15
1—Oxweld, 45 cu. ft. per hour
1—"Sight Feed," 50 cu. ft. per hour
1—"Welder's Friends," 25 lb. capacity
1—Oxweld Type MP-2, 100 lb. capacity
1—Smith Welding, 50 lb. capacity

STATIONARY AIR COMPRESSORS

1—8"x8" Gardner-Denver S. St. Horizontal
1—173 Cu. Ft. Chicago Pneumatic S. St. Horizontal
1—10½"x4⅜"x6" Rix
1—9"x8" Gardner Governor Co. S. St. Horizontal
1—270 Cu. Ft. Worthington 2 St. Horizontal
1—285 Cu. Ft. Worthington 2 St. Horizontal
1—340 Cu. Ft. Gardner-Denver St. Vertical
1—14¼x9¼" Ingersoll-Rand 2 St. Horizontal
1—16x10x10" Blaisdell 2 St.
1—16 & 9x12" Bury Horizontal
1—18 & 11x12" Laidlaw-Dunn-Gordon 2 St.

CONCENTRATING TABLES

8—Deister-Overstrom
1—No. 5 Deister
35—No. 11D Wilfley
35—No. 6 Wilfley
33—Deister Plat-O Rt. Hand
38—Deister Plat-O Left Hand
6—Deister-Overstrom
4—No. 3 Deister

CRUSHING ROLLS

1—Triplex 9"x3" housing and feed hopper
1—Triplex 7"x3" housing and feed hopper
1—20"x12" Dewco Convertible type
3—27"x14" McFarlane
1—30"x14" Traylor type "A"
2—36"x16" Davis Standard
4—36"x16" McFarlane Rolls
1—36"x16" Dewco Convertible
4—40"x16" Colo. Iron Works

ORE CARS

29—24" Gauge, Side Dump
4—26 Cu. Ft. Side Dump, Self Dumping
28—1½ Yd. Peteler Two Way Dump
1—Automatic Tilting, Side Dump, 42 Cu. Ft.
2—Automatic Tilting, Side Dump, 80 Cu. Ft.
1—13 Cu. Ft. Ore Car S.H.
28—Side Dump, 50 Cu. Ft.

TROLLEY LOCOMOTIVES

10—3-Ton Jeffrey Cast Steel Frames
5—3½-Ton Jeffrey, Cast Steel Frames
1—3½-Ton Baldwin, Two Motors
15—6-Ton, Jeffrey—Armor Plate
2—6½-Ton G.E., 36" Gauge
2—6-Ton G. E., 36" Gauge

BATTERY LOCOMOTIVES

1—2½-Ton Jeffrey—Inside Wheels
1—3½-Ton Jeffrey—Inside Wheels
5—3½-Ton Jeffrey—Charged by Trolley
1—3½-Ton Atlas—Type B
1—5-Ton Mancha—"Whippet X"
2—5-Ton General Electric—Type LSB
1—7-Ton Mancha—"Hercules"
4—6-Ton Westinghouse—Bar Steel Frames
1—2½-Ton Mancha—Inside Wheels

VACUUM PUMPS

1—14"x8" Oliver, Horizontal
2—14"x9" Worthington, Horizontal
1—14"x12" Marsh, Single Stage
1—18"x12" Worthington, Horizontal Duplex

JAW CRUSHERS

2—8"x8" Universal, Semi-Steel Frame
1—5"x12" Sturtevant, Roll Type
1—8"x7" Baker, Blake Type
3—7"x10" McFarlane, Blake type
3—9"x15" Davis, Blake Type
1—12"x24" Allis-Chalmers, "Extra Heavy"

BULLETIN NO. 421 E
Recently Revised Stock Listing.
Write for your copy today.

1775 BROADWAY NEW YORK CITY

ESTABLISHED 1898

MORSE BROS. MACHINERY CO.

P.O. BOX 1708 DENVER, COLORADO, U.S.A. CABLE "MORSE"

DEPENDABLE RECONDITIONED MACHINERY — MINING ★ ELECTRICAL INDUSTRIAL ★ MILLING

Perrot & Brauen
Caixa Postal 3574
Sao Paula, Brazil, S. A.

Bucchi C. & Cia. Ltda.
Casilla 157-D
Santiago, Chile, S. A.

Perrot & Brauen
Caixa Postal 288
Rio De Janeiro, Brazil, S. A.

SEARCHLIGHT SECTION

SPECIALS

1—Complete Assay Office.
2—8'x10' Drum Filters complete with accessories—like new.
2—7'x48" Hardinge Mills—with motors.
1—6'x16" Hardinge Mill—with motor.
1—6'x6' Allis Chalmers Ball Mill—with motor.
4—Wilfley Sand Pumps—2" and 4".
1—5'x18' Allis Chalmers Tube Mill—with motor.
2—60' Dia. x 12' Steel Thickeners—with mechanism.
1—Two ton 18" or 24" gauge Electric Storage Battery Locomotives with Charging Sets and Batteries—like new!
1—Allis Chalmers Centrifugal Pump 8"—1200 GPM against 320' Head.
1000 tons Structural Steel
1—50,000 gal. Tower Steel Water Tank with 36' Steel Tower—hemisphere bottom.
1—100 tons daily capacity Flotation Plant with Diesel-Electric Power Plant. Location Nevada.
1—320 HP. Diesel-Electric Power Plant direct connected to 200 KVA Westinghouse 3-phase, 60-cycle, 440-volt Generator with all accessories and Power House Building. Location Nevada.

COMPRESSORS

450 C.F.M. Sullivan Angle Compound.
1000 C.F.M. Ingersoll-Rand Steam Driven.
238 C.F.M. Actual Sullivan—UNITAIR.

Rails—cars—locomotives
Mining and Milling Equipment.
Complete plants purchased.

Hyman-Michaels Company
United Commercial Co. Div.
2200 Jerrold Ave. San Francisco

Immediate Shipment Low Prices — **NEW RUBBER** — *Guaranteed High Grade*

CONVEYOR and TRANSMISSION BELTING

CONVEYOR BELTING
ABRASIVE RESISTANT COVERS

Width	Ply	Top-Bottom	Covers
48"	8	1/8"	1/16"
42"	5	1/8"	1/16"
36"	6	1/8"	1/16"
30"	6	1/8"	1/16"
30"	5	1/8"	1/16"
24"	5	1/8"	1/32"
24"	4	1/8"	1/32"
20"	5	1/8"	1/32"
20"	4	1/8"	1/32"
18"	4	1/8"	1/32"
16"	4	1/8"	1/32"
14"	4	1/16"	1/32"
12"	4	1/16"	1/32"

TRANSMISSION BELTING
HEAVY-DUTY FRICTION SURFACE

Width	Ply	Width	Ply	Width	Ply
18"	6	10"	6	6"	5
16"	6	10"	5	5"	5
14"	6	8"	6	4"	5
12"	6	8"	5	4"	4
12"	5	6"	6	3"	4

ELEVATOR BELTING
HEAVY-DUTY RUBBER COVERED

Width	Ply	Top-Bottom	Covers
12"	6	1/16"	1/16"
14"	6	1/16"	1/16"
16"	6	1/16"	1/16"
18"	6	1/16"	1/16"

ENDLESS "V" BELTS
"A" — WIDTH — All Sizes
"B" — WIDTH — All Sizes
"C" — WIDTH — All Sizes
"D" — WIDTH — All Sizes
"E" — WIDTH — All Sizes
Sold in Matched Sets

RUBBER HOSE
ALL SIZES FOR
AIR — WATER —
STEAM — SUCTION —
FIRE — WELDING —
ETC.

Inquire For Prices :—: Mention Size and Lengths

CARLYLE RUBBER CO., INC.
66 PARK PLACE NEW YORK, N. Y.

FOR SALE

Eight Mile—Aerial Tramway

43,200-Ft. Each, 1⅛" and ⅞" Track Cables.
82,600-Ft. ⅝" Cast Steel Lang-Lay Traction Rope.
Complete with 84-Buckets, Steel Towers, Tension Stations, Terminals, Etc. Capacity 100-Tons 8-Hrs.

H. T. Neal Machinery Company
#58 Sutter Street San Francisco

New "Searchlight" Advertisements

Received by January 2nd will appear in the January issue, subject to limitations of space available.
Address Copy to
DEPARTMENTAL STAFF
ENGINEERING & MINING JOURNAL
330 West 42nd St., New York City

"SEARCHLIGHT IS Opportunity Advertising

—to help you get what you want.
—to help you sell what you no longer need.

Take Advantage Of It

For Every Business Want

"THINK SEARCHLIGHT FIRST"

FOR SALE

2—**Lidgerwood Mine Hoists** 150 HP and 250 HP 250 FPM and 400 FPM, 2 years old.
2—**Burgess Heavy Duty Silencers,** special CA 28x8164.
5—800 ft. length 1⅝" **Used Wire Rope.**
4—96" **Head Sheaves** grooved for 1⅝" Rope.

Frazier-Davis Construction Company
CARMEL, NEW YORK

WANTED

FOR SALE

THREE
MANCHA TITAN B
2 TO 2½ TON
STORAGE BATTERY
LOCOMOTIVES

New Locomotive Guarantee

GREENSBURG MACHINE CO.
GREENSBURG, PENNA.

FOR SALE

1—Left hand drive 8' x 30' **Dorr Classifier,** Type DSF—Raking capacity 80 T./Hr. Speed—17 S.P.M.—Formerly driven 24 S.P.M. 5" channel iron on rakes. 10 H.P. **Westinghouse Gear Motor,** output speed 445 R.P.M. 220 volt—60 cycle—24.4 Amps.

FOR SALE

1—16' x 42'8" x 24' **QSFB Turret Bowl Classifier, Speed**—16.6 S.P.M. Bowl—2 R.P.M. Raking capacity—60 T./Hr. at 150 mesh separation. 15 H.P.
FS-115, Engineering & Mining Journal
330 W. 42nd St., New York City

HAVE YOU EQUIPMENT THAT ISN'T WORKING?

Call Dulien and put it to work on an Active War Production Job!

DULIEN STEEL PRODUCTS, INC.

SEATTLE 414 First Avenue South
SAN FRANCISCO Palace Hotel
LOS ANGELES 11611 South Alameda
PORTLAND Lewis Building
BUTTE P. O. 1945
NEW YORK 2280 Woolworth Building
NEW ORLEANS 3560 Howard Avenue

MINE & MILL EQUIPMENT

Immediate Delivery

AIR COMPRESSORS

2—14 & 7½ x 12 I.R. Imp. Type 10, 2 stage, 445 Cu. Ft. Disp.
1—17 & 10 x 14 I.R. Imp. Type 10 Compressor complete with 100 H.P. Motor

BALL MILLS

1—6′ x 10′ Stearns-Roger
1—5′ x 22″ Hardinge
1—5′ x 5′ Colo. Iron Works
1—4′ x 6′ Colo. Iron Works
1—42″ x 60″ Marcy
1—30″ x 3′ Baker-Regrind
1—4′ x 8′ Ruth Rod Mill with Slip-ring Motor

CONCENTRATING TABLES

10—#6 Wilfley—Enclosed Motion
2—Plat-O R.H.

FLOTATION MACHINES

1—#15—6 Cell Denver Sub "A" L. S. Drive—Wood Tank
1—#18—4 Cell Denver Sub "A" L. S. Drive—Steel Tank

CRUSHERS

1—8 x 18 Universal
1—9 x 16 Universal
1—8 x 12 Universal

CARS

7—Card, End Dump, Roller Bearing
5—Truax End Dump, Roller Bearing
6—Side Dump 1 Ton cars—Roller Bearing

HOISTS

1—Double Drum Sauerman, drag-line with 4 Cyl. Hercules Eng.
1—50 H.P. All Steel Vulcan, with Motor
2—50 H.P. Vulcans

TRANSFORMERS

2—20 KW Ft. Wayne—1100/2200-220/440 volts
1—25 KW Maloney—1150/2300-115/230 volts
Other Transformers—3 KW to 7½ KW

MISCELLANEOUS

1—22″ x 7′ Lodge & Davis Lathe
1—3′ x 6′ Telsmith Vib. Screen
Wilfley Sand Pumps—2″ & 3″
1—96 KW G.E. Generator, 2200 volts, direct connected to Chuse Engine, with switchboard.
1—35 KW West. 230 Volt D.C. Generator with switchboard
1—100 KVA West. Synchronous Motor, 2300 volts, with starting equipment
Truck Scales—10 ton to 15 ton
1—36″ Vezin Tripple Sampler
Laboratory Equipment
1—150 H.P. H.R.T. Boiler 125# pressure complete with stack & fittings.
Pipe—2″, 3″, & 4″
1—#100 Unit Cell—Mule Drive
Tramway Equipment
Motors—2 H.P. to 50 H.P.

Write for Catalogue

FLORENCE MACHINERY & SUPPLY COMPANY

Warehouse and Yards
Florence, Colorado

General Office
904 Equitable Bldg., Denver, Colo.

Don't Delay — SPECIAL OFFER — *Immediate Shipment*

HEAVY DUTY **RUBBER HOSE** GUARANTEED

WATER HOSE

Each Length with Couplings Attached

I.D. Size	Length	Price per Length
¾″	25 feet	$4.50
	50 "	9.00
1″	25 "	6.25
	50 "	12.00
1¼″	25 "	7.50
	35 "	10.50
	40 "	12.00
	50 "	15.00
1½″	25 "	10.00
	35 "	14.00
	50 "	20.00

LARGER SIZES ALSO AVAILABLE

AIR HOSE

I.D. Size	Length	Per Length	Couplings
½″	25 feet	$5.00	$1.50 Pair
	50 "	10.00	1.50 "
¾″	25 "	7.50	2.50 "
	50 "	15.00	2.50 "
1″	25 "	10.00	3.50 "
	50 "	20.00	3.50 "
1¼″	Price on Application		
1½″	" "	"	
2″	" "	"	

OTHER SIZES ALSO AVAILABLE

All Prices—net—F.O.B. New York—Federal Excise Tax Included
ALL HOSE GUARANTEED

CARLYLE RUBBER CO., Inc.

64 PARK PLACE — NEW YORK, N. Y.

FOR SALE

24 side dump narrow gauge mine cars
350 ft. Ingersoll Rand Stationary Compressor
75 KW, 250 volt DC Generator
125 HP high pressure fire box Boiler
1—6″ Sand Pump

JOSEPH BEHR & SONS, INC.
ROCKFORD — ILLINOIS

A Real Purchase Opportunity!

ELECTRIC SHOVEL

6½-7½ yard, Bucyrus 320-B; R.R. Trucks

IRON & STEEL PRODUCTS, INC.
37 years' experience
13476 S. Brainard Ave., Chicago, Illinois

AIR COMPRESSORS:

(7) Steam 46 ft., 66 ft., 300 ft., 600 & 1000 ft.
(12) Belted, 360, 676, 870, 1300 ft.
(6) Electric, 1300, 1500, 1722, 2600, 5000 ft.
(14) Gasoline, 110, 160, 220, 310 & 370 ft.
6 Diesel 105, 315, 420, 603, 1000 & 1500 ft.

HYDRAULIC CARWHEEL PRESSES:

100 Ton, 150 Ton, 200 Ton, 300 & 400 Ton Caldwell-Niles-Wood-Watson Stillman

STORAGE BATTERY LOCOMOTIVES:

3—3 ton Whitcomb, 24 Ga.
6—5 ton Whitcomb & Mancha, 30 Ga.
4—4 ton Goodman, 36 Ga.
3—5 ton G.E., 36 Ga.
4—6 ton Goodman 36 Ga.
5—8 ton Baldwin-Westgh., 36 Ga.
4—13 ton G.E., 36 Ga.
6—Goodman 10 ton, 36 Ga.

TROLLEY LOCOMOTIVES:

3—3 ton & 2—4 ton Goodman 36 Ga.
5—6 ton Baldwin Westgh., 36 Ga. Comb.
4—6 ton Goodman 42 Ga. & 3 Goodman 36 Ga.
3—8 ton Goodman 36 Ga.
4—6 ton Baldwin-Westgh., 42 Ga.
3—8 ton & 10 ton G.E. 42 Ga.

RUBBER CONVEYOR BELTS:

1000′ 60″, 600′ 30″, 300′ 20″, 1600′ 42″, 500′ 40″, 1450′ 36″, 1200′ 24″, 900′ 18″, 600′ 16″, 350′ 14″.

CONVEYOR PARTS:

Idlers, Head & Tail Pulleys, Steel Frames, Tripper, etc., 14 in., 60 in. Large Stock in Jersey

SYNC. MOTOR GENERATORS:

5-15-25-40 kw. Battery Chargers
5—50 KW 1800 RPM 3/60/440-120 V
100 KW Westgh. 900 RPM 3/60/2200-250-275
100 KW Ridgway 1200 RPM 3/60/2200-250-275
150 KW G.E. 1200 RPM 3/60/2200-250-275
200 Ridgway 900 RPM 3/60/2200-250-275

TUGGER HOISTS:

30 Ingersoll Rand Electric DD, 7½ HP, 15 HP, 20 HP, 35 HP & 45 HP
6 Ingersoll Rand SD Air Tuggers

DRIFTER DRILLS:

75 Worthington 169 & 180 Ingersoll Rand X71 & S70 Gardner Denver 89B, 25—IRDA 35

PUMPS:

25—IR size 25 Air
7—IR 2½—25 HP Motor pumps
6—CP, CP7 Port Sludge
105 High Head Elec. 50 to 500 HP

ROTARY KILNS:

5′x24′, 7′x40′, 6′x60′, 7′6″x125′, 8′x160.

ROTARY DRYERS, Direct Heat:

Double Shell: 5′x26′, 5′x30′, 5′6″x60′, 80″x45′
Single Shell: 5′x30′, 6x40, 6x50, 6x60, 7x60, 8x120
Indirect Heat: 2—4′x20′, 5x30, 6x40

STEEL WATER TANKS

75000 gal. on 106′ tower.
50000 gal. on 80′ tower.
35000 gal. on 90′ tower.
25000 gal. on 44′ tower.

STEEL OIL TANKS

26—5000, 6500, 80000, 15000, 20000, 25000 & 30,000 gal. cap.
9—10000, 30000 & 55000 BBL.

ALL SIZES BOUGHT AND SOLD.

MACHINERY:

2′4″ Traylor T.Y. Crusher
2′, 4′, 5′, 7′ Symons Cone Crushers.
36x20′ Diamond Crushing Rolls
120 Flat & Dump Cars, 1 to 5 ton
Model 20A, 30A & 50 & 60 Conway Muckers
Model 21 Findley Elmco Loader
GD 9 Gardner Denver Loader
5—Tyler Hummer Vibrating Screens, 4x5 & 4x8
Sullivan Loading Slide with Sullivan Hoist
Ball Mills: 3′x36″, 7′x22″, 8′x22″ & 8′x10′
Jaw Crushers: 9x16, 6x20, 10x20, 11x20, 10x30, 18x36, 15x36, 24x36, 28x36, 24x48, 36x48, 42x48, 48x60, 66x86, 30x18, 7x10, 6x20
6—Kennedy 19, 25, 37 & 49 Crushers
7—I.R.—40, 50 & 52 Sharpeners
4—Gardner DS6 Drill Sharpeners
7½, 15, 20 & 30 KW Battery Chargers
135 KW F.M. Rusil Generator.
5 Caterpillar Gas Draglines, 1 yd. to 3 yd., 40 to 97 ft. booms
3—Monaghan 3W 4W and 5W Diesel Draglines

R. C. STANHOPE, INC.
60 East 42nd St. — New York, N. Y.
Cable Address New York: Stanequip

BELT CONVEYORS IN STOCK

12"-14"-16"-18"
20"-24"-30"-36"

ALSO

CONVEYOR BELTING

CATALOG N ON REQUEST

"The test of time since '99"

TEUSCHER PULLEY & BELTING CO. 801 N. 2nd ST., ST. LOUIS, MO.

FOR SALE

HOIST

1—Double Drum Sauerman Bros. Hoist with direct Waukeshaw Gas Engine Drive complete with ¾ yard cable way bucket and cable, like new.

Large Steam Pumps
Large Steam Air Compressors
Guaranteed Used Pipe
Steel Buildings
Tanks of all kinds and sizes

Jos. Greenspon's Son Pipe Corp.
Nat'l. Stock Yds. (St. Clair Co.) Ill.

ALPHABETICAL INDEX TO ADVERTISERS

*** Where an asterisk precedes manufacturer's name, more detailed information may be found in the *1942 edition of Metal and Non-Metallic Mining Catalogs*, the combined catalogs of manufacturers of mining, milling, smelting and refining equipment.**
Where † appears after a name, the advertisement does not appear in this issue, but appeared in preceding issues.

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American Brass Co. ..... †
*American Cyanamid Co. ..... Insert Between pp. 19-22
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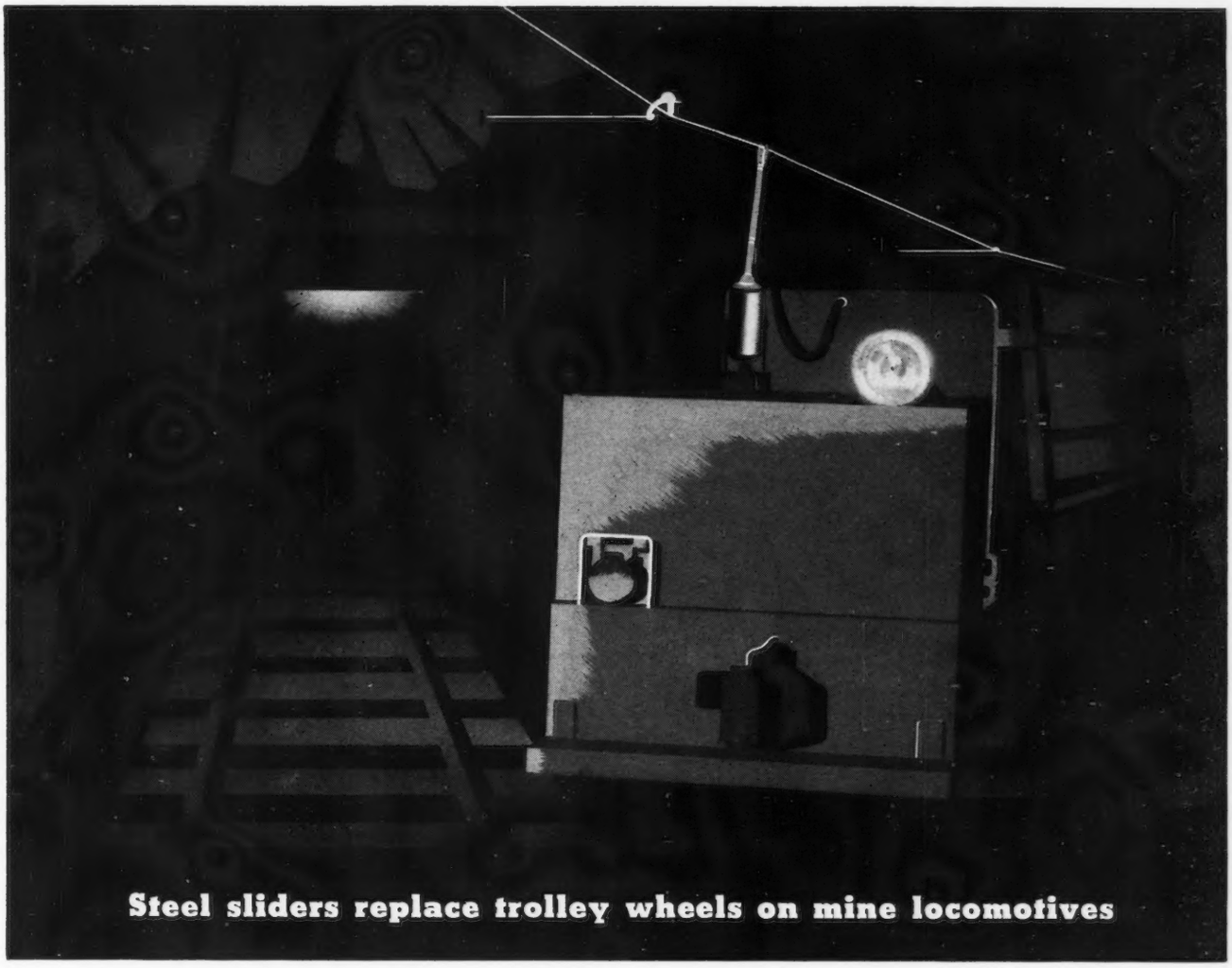

Steel sliders replace trolley wheels on mine locomotives

Information supplied by "Engineering & Mining Journal"

One mine has solved the problem of replacement of bronze trolley wheels by substituting a sliding steel collector for the bronze wheel. The slider is shaped somewhat like the pantograph collector on large electric locomotives. Thus it is enabled to follow irregularities in the trolley wire without losing contact.

Being a sliding contact, there is less arcing than with a wheel. The greater area of contact, and the heavier section of the slider compensate for the difference in conductivity of the two materials.

It has been found that proper lubrication of the trolley wire is an important factor in securing good service. In this mine, a mixture of graphite and carbon tetrachloride is applied to trolley wires once a month.

The mixture is put on the wire 5 or 6 hours before using, so that it can dry thoroughly. In addition to acting as a lubricant, it burnishes the wire, insuring less contact arcing.

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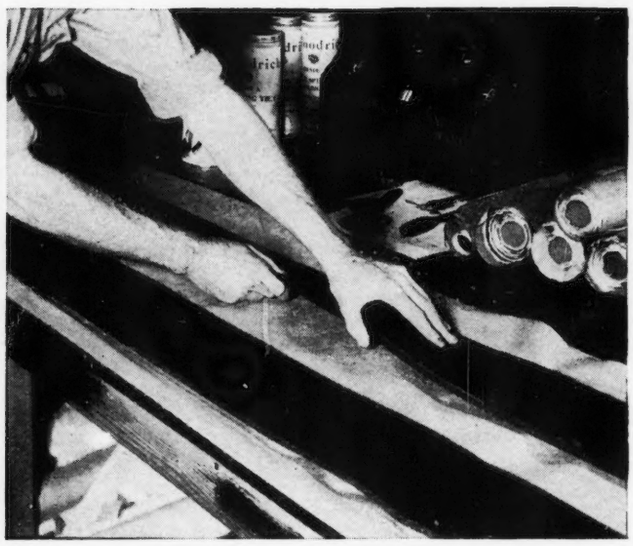
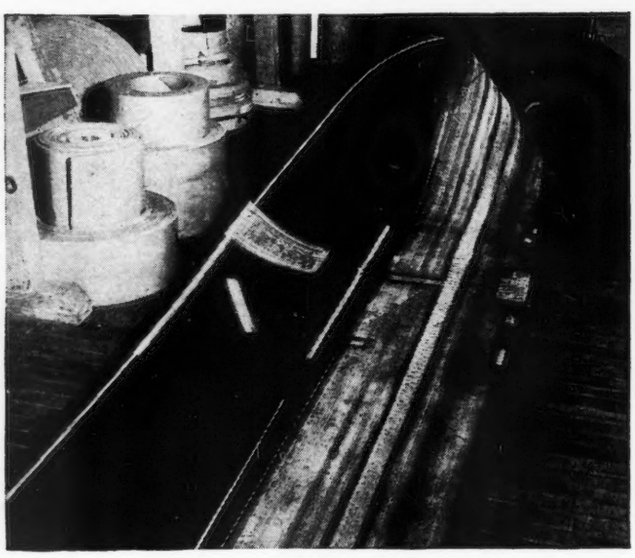
Here's how others are conserving rubber

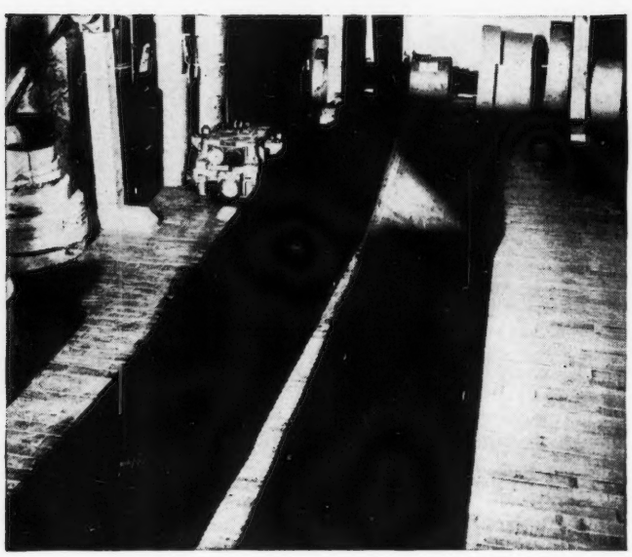
Trimming edges on a 6" feeder belt preparatory to putting on new rubber.



Same belt after it has been repaired. Good for many months additional service.



20" feeder belt with rubber removed from damaged places.



Same belt after it has been repaired. (To replace this belt with a new one would needlessly have consumed 200 pounds of rubber.)

Conveyor belts can have 9 lives

Another B. F. Goodrich suggestion to save rubber

LIKE the proverbial cat that has 9 lives, old, worn conveyor belts (and even belts that have been discarded) are proving they have additional lives —many are being revived for months of use that owners never expected.

It's being done by the B. F. Goodrich repair method — worn parts are cut away, repair sections are fitted in and vulcanized in place by a portable vulcanizer. Cuts, gouges, tears, breaks and worn edges can be repaired in this way. Belts worn to the point of danger can be made safe, many belts already discarded can be put back into service, and tons of rubber can be conserved.

If you have any old conveyor belts that need repairs or that have been discarded, see your B. F. Goodrich distributor or write us for his address. Most distributors are trained and equipped to make belt repairs right in your plant. And they can show you how to save rubber in many ways, by proper care and maintenance of all your industrial rubber products. Write us, too, for a free set of folders on conservation of rubber products and, if you use conveyor belts, for the B. F. Goodrich Belt Conservation Manual. *The B. F. Goodrich Co., Industrial Products Division, Akron, O.*

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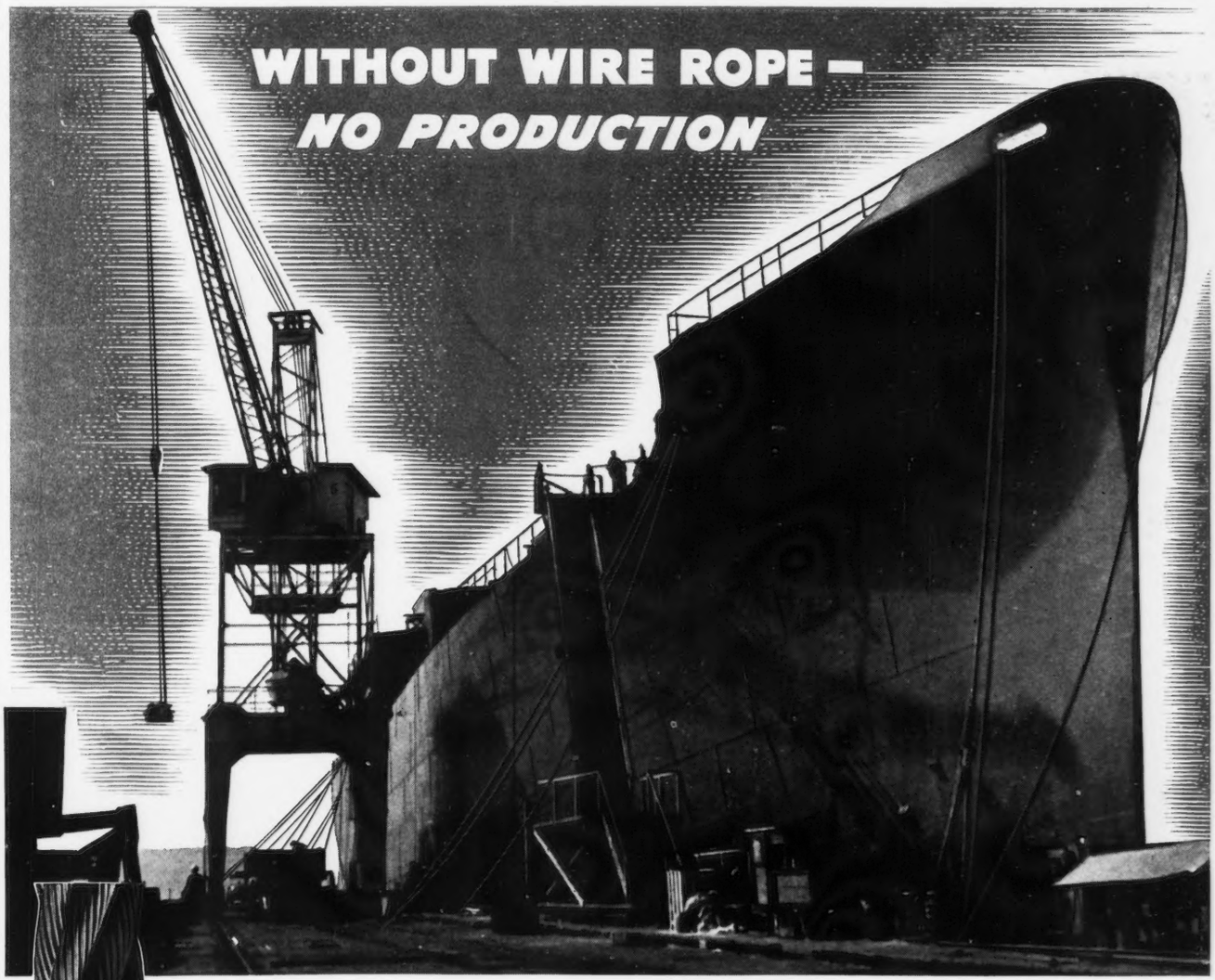

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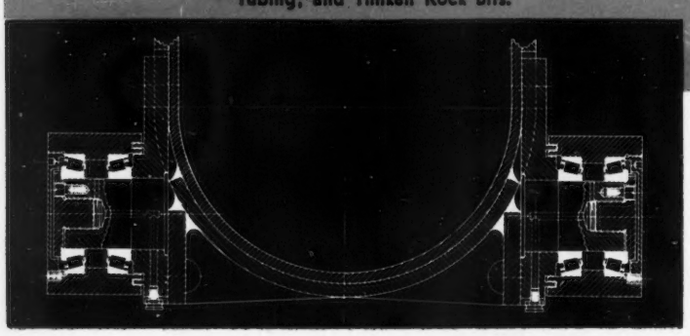

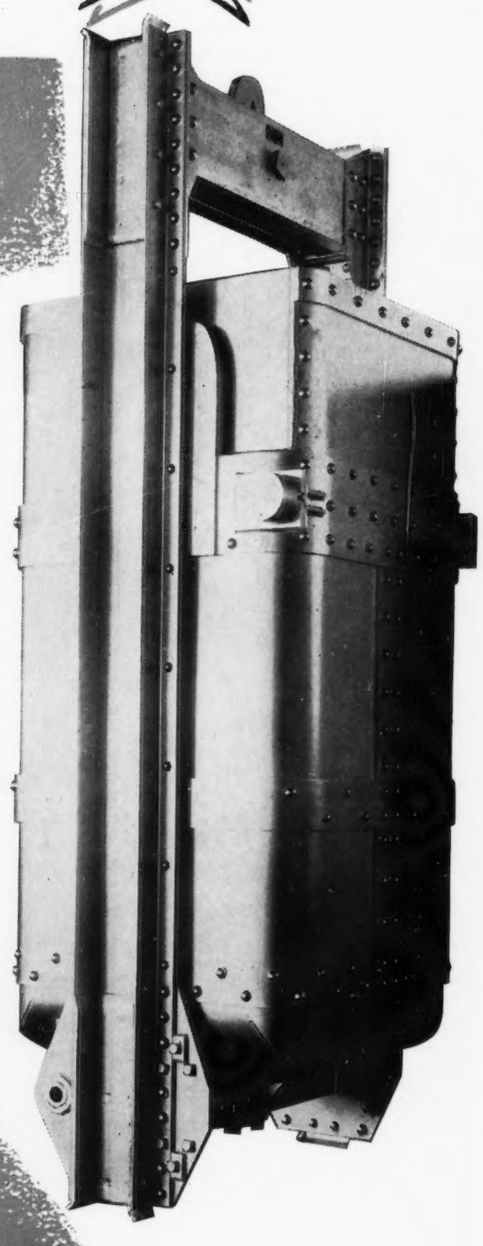

Timken Bearing Equipped Skip Car manufactured by Lake Shore Engineering Company Marquette, Michigan.

Application of Timken Bearings on skip roller and drum rollers of Lake Shore Skip Car.